OCTOBER 1954

FOUNDRY

...WHEREVER METALS ARE CAST

QUALITY CONTROL
A Way To Cut Scrap—p. 126

MODERN FOUNDRY DESIGN
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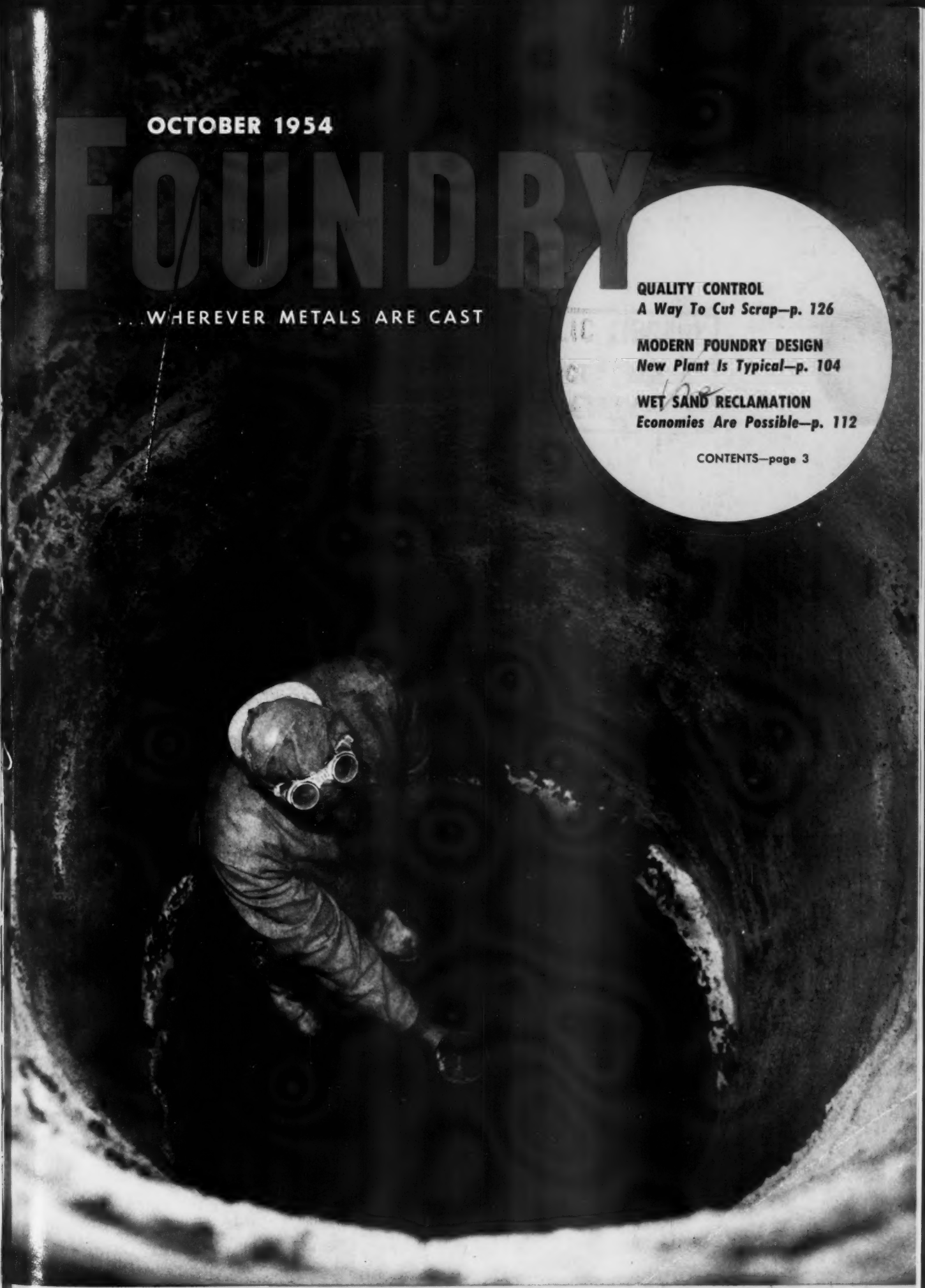

Simple System Provides Rapid Cupola Charging—p. 116

FOR BETTER MELTING... CLEANER IRON—

PURITE

1. Purite produces higher percentages of finished castings—fewer rejects per ton of metal poured.
2. Purite gives 100% fluxing action in the cupola—100% desulphurizing action in the ladle.
3. Purite is time-tested and proved for rapid and unsurpassed desulphurizing uniformity.
4. Purite permits the use of higher-sulphur raw materials.
5. Purite is 100% pure fused soda ash—you do not pay for inert materials.
6. Purite comes in uniform 2-lb. pigs—no weighing or measuring required.
7. Purite does not crumble—is easy to handle—no waste, no dust.
8. Purite can be shipped in bulk carloads at substantial savings over bag shipments—is easily stored without deterioration.

Purite, the scientific flux, is sold by leading foundry supply houses in the United States and Canada.

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INDUSTRIAL CHEMICALS DIVISION

Baltimore 3, Maryland

2625

A break at the end

...or how Chuck Wright made certain of success in every way

"You know how competitive the machine tool business became after the Korean War. Customers became real choosey," remarked Chuck Wright, foundry specialist for the INCO distributor.

"One company I call on," continued Chuck, "the Dever Machine Tool Works, decided that open grain in lathe ways absolutely had to be improved. So, Pete Pitlak, foundry superintendent, began to cut silicon. And inspection showed he was successful... the open grain disappeared.

"But a week or so later, the roof caved in. Because when the machine shop had gotten around to machining these castings, they found hard spots, chills and no end of chipped corners.

"Pete had started off to get rid of open-grained iron in his heavy-section castings...by running down the silicon in his iron until he got the density he wanted in heavy lathe ways and the like. The result was fine. But even these heavy castings had light sections . . . edges of pedestals or legs, for instance . . . that came out hard and brittle, and caused a peck of trouble for the machine shop.

"His biggest trouble, however, came from using the same iron for smaller machine tool castings. That really started a fracas. In some castings the ends of the ways came out so hard that machinists operating the planers chipped or broke off end pieces large enough to scrap the whole works.

"After arriving in answer to Pete's call for help, I explained how he could use nickel to suppress chill in light sections, and so get machinable, close grained iron in all sections. Nickel additions help you get all the benefits of a low silicon iron without any of the disadvantages.

"Pete got the idea. Nickel renders iron uniform in all sections. With 1.5 to 2% nickel, he used his low-silicon mix for both light and heavy castings. Those given a flame hardening of the ways developed the desired hardness with a minimum of warping. You see, nickel lowers the critical point, reducing the amount of heat needed. As a result, stresses from the "quench" at a lower temperature are reduced.

"Don't sweat alone with a metal problem. Do as Pete did. Drop me a line . . . I'll be glad to come out and give you some practical help."

Chuck Wright

EMBLEM OF INCO SERVICE

The International Nickel Company, Inc.

67 Wall Street New York 5, N. Y.

FEDERAL ADDITIVES FOR BETTER SAND PREPARATION

(May be used as dry additives or in slurry)

Here's a striking verification of the truth in the old saying that "good things come in threes." For here are three sand additives that really are good! Additives that produce the exact sand characteristics necessary for good, dependable sand preparation.

You can vary the amount of Federal's GREEN BOND Bentonite added to your sand (*Pulverized or GB100 Granular for dry additives — #1200 Slurry Grade Granular for slurry use*) to provide the correct green and dry strengths for each type of work. Federal's CROWN HILL Seacoal gives the desired carbon content. And the addition of Federal SAND STABILIZER creates better flowability, regardless of compression strength—thus making for more uniform, faster ramming. It also provides a wider range of *safe* moisture content and better shakeout—permitting maximum sand reclamation. Federal's "three" really do an outstanding job of promoting better and easier sand control—economically!

And if this isn't enough to convince you—just consider that these three additives will cost you *less than $1.00 per ton of castings produced!* A new bulletin tells all about Federal's "three good things." Write for your copy today!

IMPORTANT
FOR SLURRY USERS!

If you use the slurry system of sand bonding, you'll want to learn about Federal's #1200 Slurry Grade, Granulated Green Bond Bentonite ... and how it's used with Crown Hill Seacoal and Federal Sand Stabilizer to make the perfect slurry. We'll gladly consult with you or send complete information.

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Make your foundry a better place in which to work!

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FOUNDRY

October 1954

Volume 82—Number 10

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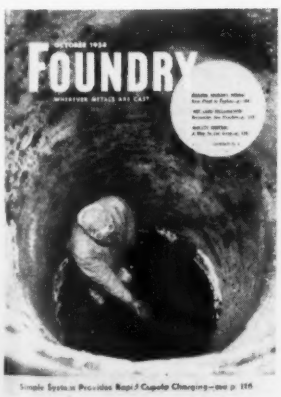

THE COVER: Ramming up the cupola bottom at a gray iron foundry that utilizes a semimechanical charging system to advantage. See story, page 116

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WHERE ACCURACY COUNTS

49 inch shell has maximum diameter of 11 inches. 1500 pounds of metal is poured into each mold to obtain a finished casting weighing 600 lb. High precision cored cavity is shown at right.

Core assembly is shown in stages from front to rear. Stacked body cores are secured by steel rods. Barrel cores are inserted after first five body cores have been assembled.

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SCORES A DIRECT HIT!

UNIQUE CAST ARTILLERY SHELLS ARE HELD TO CRITICAL DIMENSIONS AT

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(RIVERSIDE CRANKSHAFT DIV.)
ST. JOSEPH, MICHIGAN

Aberdeen Proving Grounds, after testing cast artillery shells, concluded that no other means of shell manufacture has been proven to an equal degree of accuracy . . . 5 rounds within a 29-yard square at 23,000 yards range.

The Riverside Crankshaft Division of Auto Specialties Mfg. Co. has proven the extreme accuracy of cast shells beyond a doubt.

The 280 mm. shell illustrated is a core job inside and out . . . from start to finish. Molds are made up of baked cores stacked 18 high while the cavity is formed by a barrel core held to the exacting concentricity of ± .025 inches.

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Your LINOIL man will help you select specific-purpose core oils to answer your problems. Call him today, or write to ADM at the address below.

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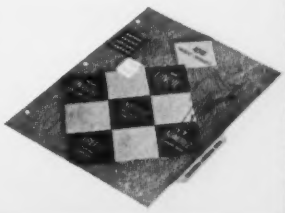
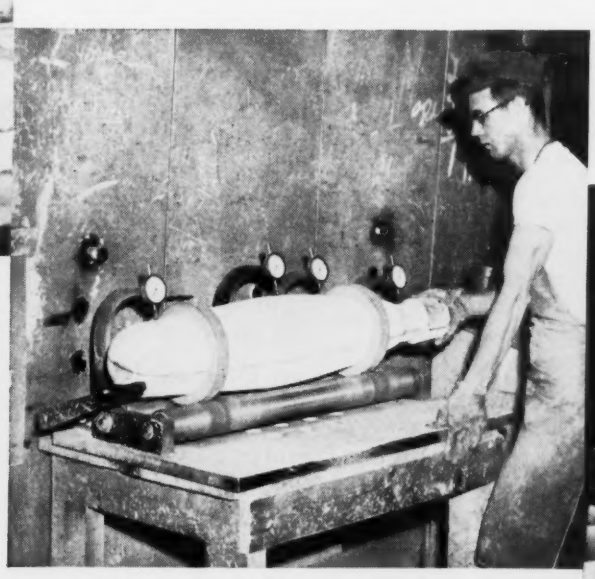
Continuous Technical Information Service on the latest developments from the ADM Sand Laboratory . . . furnished in handy file-folder form for quick reference. A request on your letterhead will put your name on our permanent Technical Information mailing list.





Barrel cores are made of halves pasted together . . . then tested for concentricity tolerance of ± .025.

Molds, when assembled are 84 inches high. Pouring requires catwalks and special clothing for safety.

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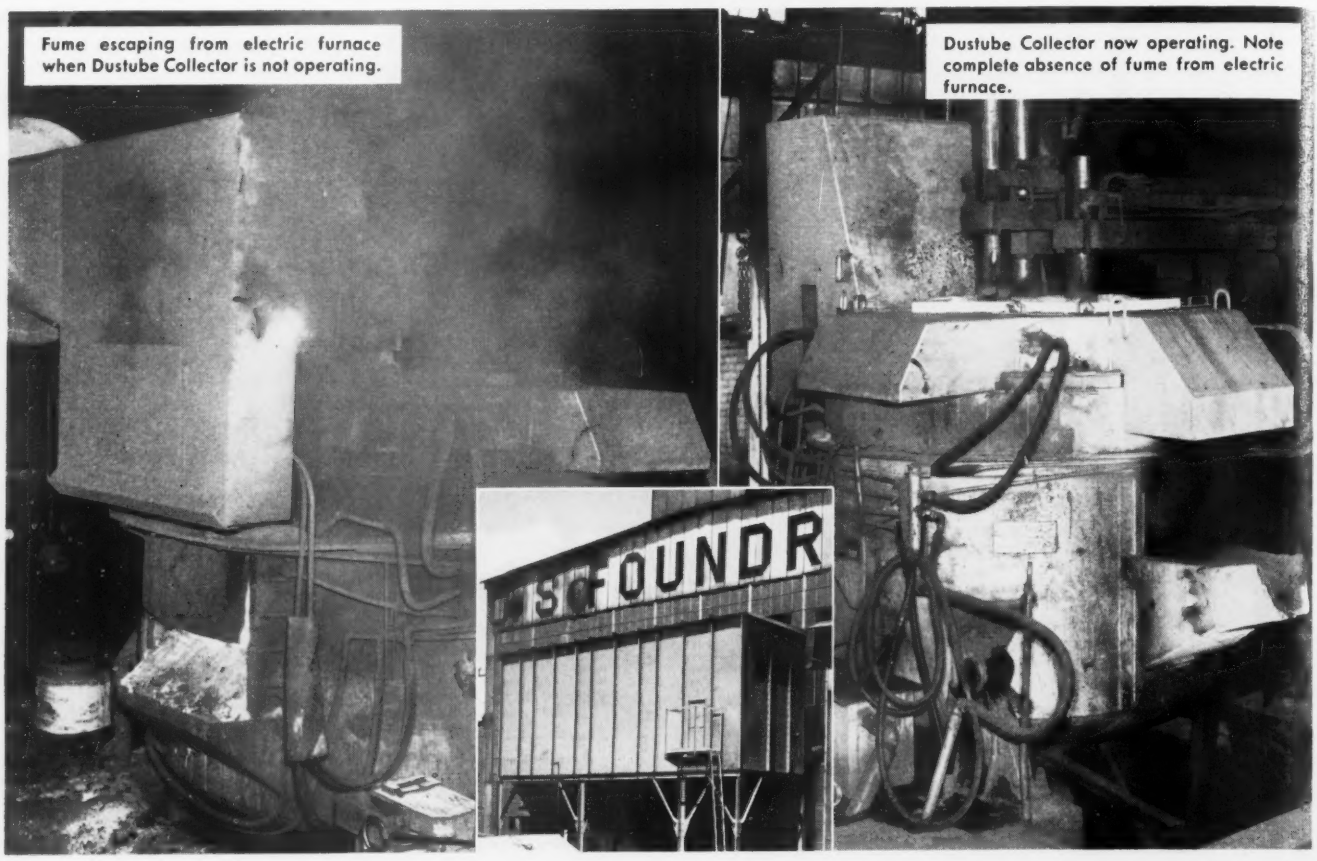
pioneering developments keep **DUSTUBE**® *first in dust control*


Fume escaping from electric furnace when Dustube Collector is not operating.
Dustube Collector now operating. Note complete absence of fume from electric furnace.

Eliminate Air Pollution From Electric Furnace Fume

Dustube Collectors Provide Highest Efficiency in Controlling Fume From Electric Steel Melting Furnaces

Atmospheric pollution from electric steel melting furnaces need no longer be a problem. Dustube cloth tube type Collector systems provide virtually complete removal of fume, discharging only clean gas. Such a system installed at a progressive Chicago steel foundry for ventilating two 5-ton electric furnaces collects weekly over five tons of very fine dust and fume which formerly dispersed into the atmosphere.

Only filtration can be depended upon to yield an effluent gas free from visible solids. And, in the modern Dustube Collector such efficiency reaches its highest peak. Other important reasons why leading steel foundries have selected the Dustube Collector for controlling this fume problem are:

1. Dustube's operation is continuous and automatic.
2. No manual labor is required and no delays are experienced for shaking down the collected fume.
3. Because of its simple design, Dustube Collectors cost less to install, operate and maintain than other types of fume control equipment.
4. Wheelabrator's wide selection of natural and synthetic fabrics provides just the right filter cloth for the application—field tested over long periods of time.

If you are interested in thorough dust or fume control at a price you can afford to pay, investigate the Dustube Collector. Feature by feature the Dustube proves its advantages. American engineers will gladly consult with you at any time without obligation.

Write today for full information.

Write for your copy of Catalog 372 today.

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COLLECTORS

Here's what makes the tractor shovel an outstanding performer on big-capacity material handling —

Users everywhere are finding the Allis-Chalmers HD-5G Tractor Shovel an excellent way to reduce production costs — not only because of its big handling capacity and economy, but because of its unusual versatility as well.

With Standard 1-yd. Bucket it is ready for any bulk material — loads trucks, feeds hoppers and conveyors, builds stockpiles.

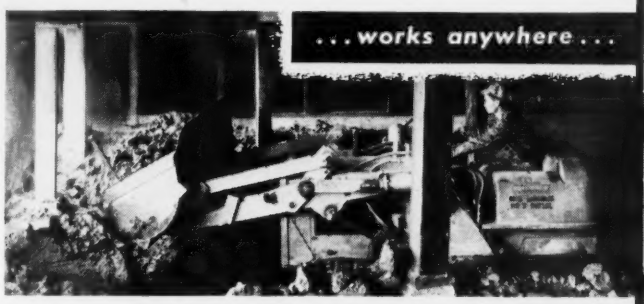
With Lift Fork attachment it skids, stacks or loads packaged or palletized loads up to 4,000 lb., steel beams, pipe, lumber.

With big 2-yd. Light-Materials Bucket it doubles output in coal, coke, other light materials.

Where desired, the HD-5G can be adapted to other special requirements through use of Narrow Bucket, Rock Fork, Crane Hook — any of 13 attachments in all. These can be interchanged in about 20 minutes by simply removing and replacing four pins.

It handles many different materials . . .

. . . works anywhere . . .



The thousands of HD-5G's can be found working indoors and out — in pits and mines, on stockpiles, around all types of plants. Their crawler treads provide traction for soft spots or steep climbs, smooth out travel over rough ground, fit them to work anywhere. Because of compactness and maneuverability, HD-5G's handle well in close quarters. With an over-all height of about 6 ft. (bucket down), they are used on many underground and other low-headroom jobs.

. . . in any weather

In winter, the HD-5G clears snow from yards, roads and parking lots — in addition to regular duties. With 40 brake hp., 16,200 lb. of weight and plenty of track on the ground, it isn't stopped by snow, ice or mud. Cabs protect operators from cold or sun.

— also does other work

The HD-5G isn't limited to handling materials. It clears or levels land for new construction, digs basements and trenches, backfills, builds and maintains roads, stockpiles and reclaims coal, saves money and man-hours on dozens of jobs the year around.

Ask for a demonstration — Your nearby Allis-Chalmers industrial tractor dealer will be glad to *show* you just what the HD-5G or one of the larger 2-, 3- or 4-yd. Tractor Shovels will do —right on your own job. Or write for additional information.

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You can expect...and get cost-saving advantages by using TAM* ZIRCONITE* Products whether your operation is a steel, iron, bronze, aluminum or magnesium foundry.

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Even a brief investigation of ZIRCONITE* Products will convince you of their time and money saving advantages. Why not write our New York City Office for detailed facts today.

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You can do miraculous things with a MICHIGAN* Tractor Shovel because of *extra power when it's needed*—a result of 3-to-1 torque multiplication in the CLARK Torque Converter.

● **Digging into TOUGH Material**—watch a MICHIGAN *force* its bucket into tough, compacted material: not a "shock" action—but a steady, resistless flow of *increasing power* that puts no punishing strain on the driving shafts and gears. Torque multiplication plus the terrific digging power of the hydraulic bucket rams enable the MICHIGAN to perform unbelievable feats.

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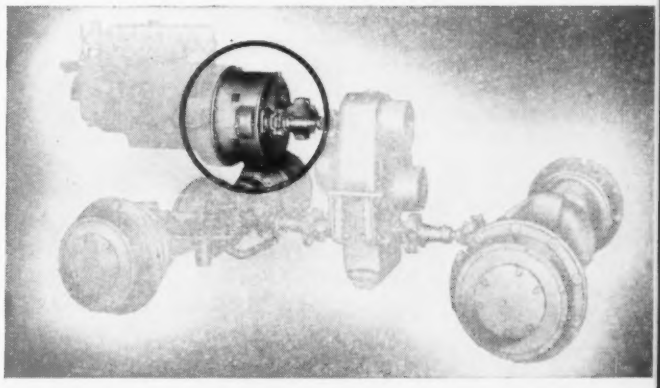
● **Make ANY Shift at ANY Time**—with the Torque Converter, driving is as easy as handling your car! Shift into Forward or Reverse, into High or Low range *while moving in either direction* . . . the Torque Converter absorbs shocks.

● **Standard Equipment on All Models**—Clark is first to present a full line of Tractor Shovels with Torque Converter as standard equipment. See the MICHIGAN Tractor Shovel. Watch it in action, demonstrating its astonishing power, speed and maneuverability.



Talk to your MICHIGAN dealer; and send for the MICHIGAN Fact Folio, handy file of specifications and action photos—the coupon gets prompt action.

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19A

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Please send the MICHIGAN Tractor Shovel FACT FOLIO

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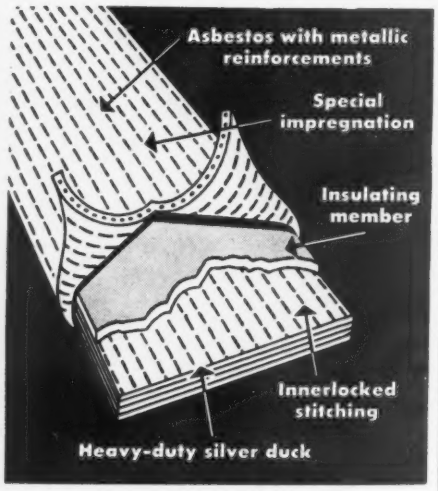

WITHSTANDS HEAT, TOO!

Insulated SAHARA Belts have long been famous for maximum heat resistance and long wear. Almost every plant that has tested these belts now uses them exclusively for handling hot materials.

Now Imperial is manufacturing Sahara Insulated *Armored* Belting with wire reinforcements that gives extra value at no extra cost. The reinforcing wire is spun together with the asbestos fibers. Result: maximum resistance to abrasion and impact, as well as heat.

Tell us your belting problem and we'll recommend the belt that will cost you less in the long run. In addition to heat-resistant belts, Imperial also makes job-designed belts for handling boxes, crates, grains and other bulk materials.

Write for Data Sheet 48-4A.

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Chicago 23, Illinois

Engineered belting
. . . the right belt for each job

WITH THE EDITORS

MOLDING SAND PRACTICE: Foundrymen always seem to be interested in the subject of sands. A speaker on that subject, or a round-table devoted to some phase of sand problems will draw a good attendance and provide interesting discussion. And as long as sand is a basic material in the production of metal castings, this interest probably will continue.

With this in mind, the editors have secured the co-operation of a number of authorities in the field of molding sand to prepare nine articles. This symposium on "Molding Sand Practice" will be presented in full in the November issue. Articles will deal with the following: Synthetic Molding Sands; Natural Bonded Molding Sands; Brass and Bronze Sand Practice; Aluminum Sand Practice; Magnesium Sand Practice; Gray Iron Sand Practice; Malleable Sand Practice; Steel Sand Practice; Testing Molding Sands.

You will find this issue particularly interesting.

—o—

Golden Anniversary: I was privileged to be at Hagerstown, Md., on Sept. 1, for the golden anniversary celebration of the Pangborn Corp., (September issue, page 208). It was quite an interesting and impressive affair. Following luncheon for employees in Pangborn Park, which is across the street from the plant, the entire plant was thrown open for inspection by employees' families, citizens of Hagerstown, and visitors from out of the city.

At 5 p.m., a large crowd gathered in front of the office to witness the impressive dedication ceremony of a tablet presented by the employees of the company. With Lloyd Stouffer, secretary and treasurer, presiding, the presentation of the tribute to Thomas W. Pangborn and John C. Pangborn was made by William B. Hays Jr. of the foundry department. Victor Stine, vice president, unveiled the tablet, (shown on page 230 of this issue). Thomas W. Pangborn accepted the tribute with a splendid address. P. J. Potter, vice president, presented a special tribute for the board of directors, and Bruce R. Artz followed with one for the sales department. Other tributes were presented by the governor of Maryland, the president of Notre Dame University and the president of the Hagerstown Chamber of Commerce. Special bronze medallions were presented the employees by John C. Pangborn.

As was pointed out by several speakers, few companies have the unusual distinction of having the firm's founder as president at the golden anniversary celebration.

—o—

Cash and Carry: Many will remember the "Valve Handle Wheeze" that was featured by Bert L. Taylor in the "Line-o-Type" column of the *Chicago Tribune* years ago. Perhaps B.L.T. would also have enjoyed the following gem, which was received by a foundry friend of ours.

Dear Sirs: I came to my shop today for the first time after an illness lasting about four weeks and find instead my castings all your correspondence, demanding $13.000 before you intend to finish the same.

What in the world are you looking for, I need those castings and had not send the patterns to you if I did not wanted any. Furthermore, my patterns cost me more than you would ever have to loose on your castings.

I ordered the castings C.O.D. that means in english cash or delivery for you may not know it.

You are writing abaut establishing my proper credit rating well, I have non, I pay only cash and want cash for all I do.

Please let me know the exact date you could deliver those castings ordered and in the mean time I wil finde out if I have not lost the job I need those castings for.

If you call it a deposit you want tell me so, and if so, you are the first firm in the U.S.A. ever asket me that.

I hope you did not dispose of the patterns for your information I paid $52.00 for same.

Waiting for a soon reply.

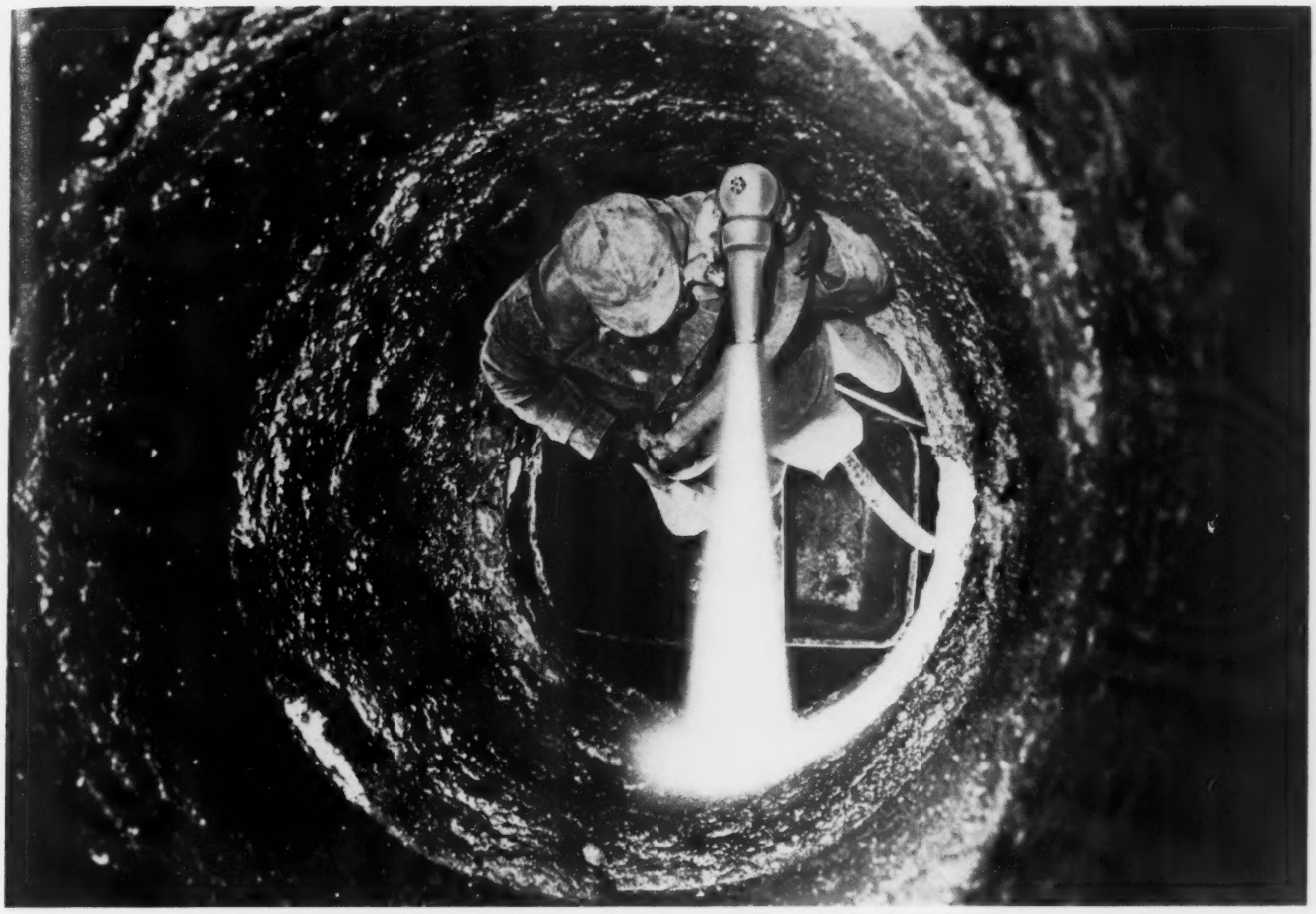
—o—

A Success Story: A souvenir centennial edition of the *Warsaw* (Ind.) *Times-Union* has an interesting article on the founding of Dalton Foundries Inc. in 1909 by Donald J. Dalton, for the manufacture of gray iron castings. Mr. Dalton was a traveling salesman for a Chicago wholesale hardware company and later was with a hardware specialty house in South Milwaukee. But he wanted to get into business for himself, so he resigned and became a manufacturer of cobbler kits for home use. This led to the organization of a small foundry in Warsaw.

How many of our industries today were started in much the same manner? The article traces the progress of the plant in the expansion of facilities, the addition of a malleable foundry in 1923, and the purchase of several companies which provided the company with a number of specialties. The latter included the "Big Boy" auto tire pump, which has been produced in large quantities and sold throughout the world. The company now is headed by Charles H. Ker, and Matt Dalton, a son of the founder, is vice president. Mr. Ker also is vice president of the Gray Iron Founders' Society.

Since Warsaw is the county seat of Kosciusko county, which adjoins my home county on the west, I was

(*Concluded on page* 12)



Gunning for savings with HARBISON-WALKER

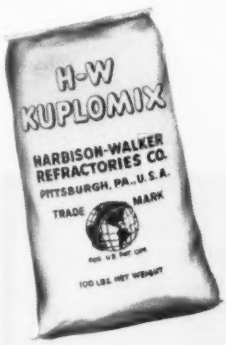
KUPLOMIX

Substantial savings in cupola maintenance are assured by the use of H-W KUPLOMIX—a modern refractory which provides joint free linings. In the foundry it is also used to good advantage for the linings of ladles and troughs.

H-W KUPLOMIX is easy to apply either by air-placement guns or by ramming. It is exceedingly resistant to the impact and abrasion of the charge, the erosive action of molten metal and slags and to the chemical attack of slags.

H-W KUPLOMIX consists of grain-sized silica quartzite of unusual purity and a highly refractory bond clay which develops a strong ceramic set at furnace temperatures.

Please write for complete information about H-W KUPLOMIX, the modern service-proved cupola refractory.



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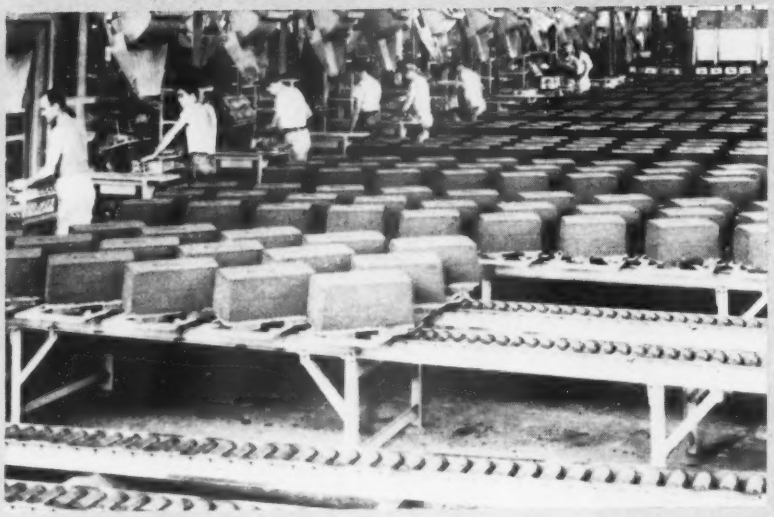
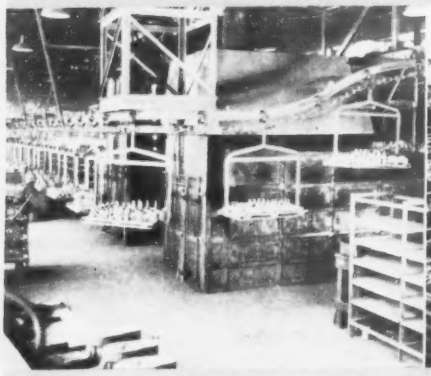
whatever you're handling—
Molds - Cores - Castings



In the modern foundry, molds are handled easily and safely on Mathews Roller Conveyers.



Overhead Trolley Conveyers in core room.

Boxes of castings move to grinders on Roller Conveyer lines served by transfer cars.

you'll do it best with Mathews Conveyers

Modern foundry production schedules require efficient material handling methods. In Foundries everywhere, Mathews Conveyers are helping to keep these schedules. Whatever your particular foundry conveying problem, Mathews engineers will help you work it out. Why not call your Mathews representative. Have him show you how Mathews Conveyers are on the job in Foundries all over the United States and Canada.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

MATHEWS CONVEYERS

GENERAL OFFICES . . . . . *Mathews Conveyer Company*
ELLWOOD CITY, PENNSYLVANIA

PACIFIC COAST DIVISION . . *Mathews Conveyer Company West Coast*
SAN CARLOS, CALIFORNIA

CANADIAN DIVISION . . . . . *Mathews Conveyer Company, Ltd.*
PORT HOPE, ONTARIO

Engineering Offices or Sales Agencies in Principal American and Canadian Cities

(*Concluded from page* 10)

particularly interested in this story. As a boy in Plymouth, Ind., I remember seeing shipments of gray iron castings from Dalton at Warsaw to Clizbe Bros. Mfg. Co. at Plymouth. Clizbe made various types of stand grinders. As I look back now, I believe those were mighty good castings.

—o—

Fifty-four Years: Speaking of centennials, the Springfield Foundry Co., Springfield, Mass., whose 100th year of operation was reported under "Late Foundry News" in the August issue, has had over 13 per cent of its employees affiliated with it for more than 25 years, but only one is a member of the 50-year club. Jean M. Moreau, who has been with the company for 54 years and has no desire to be retired, believes she may have the longest individual record of continuous employment in the Springfield area. She remembers well the time when the foundry was asked to make castings for the Duryea automobile. She points out that this was back in the day when men received $2.25 for a nine-hour day and customers paid only 2½ cents a pound for castings. Miss Moreau is a direct descendent of General Moreau of French Revolution fame.

—o—

Here We Go Again: Foundrymen surely enjoy going to meetings as much or more than any other industrial group. During about 10 months of the year, annual meetings, industry meetings, regional meetings, sectional meetings, technical meetings, chapter meetings, cost meetings, merchandising meetings, outings, Christmas parties and many other gatherings furnish a point of interest for managers, production personnel, technical men and many workers in plants. But the bulk of this activity is concentrated in the spring and fall, and we are now heading into the usual hectic period extending from the latter part of September through October and well into November.

Rather strenuous travel schedules have been set up for the editors so that these important meetings may be attended and the important happenings reported to readers. This part of the assignment is work, but the privilege of visiting again with many friends throughout the country, and in enlarging the circle of acquaintances, provides the pleasant part of that fall merry-go-round. We surely are looking forward to seeing you.

F.G.S.

Hundreds of hours longer . . .

NORBIDE® Pressure Blast Nozzles

outwear any other type

- 750 hours using silica sand
- 1500 hours using steel shot or grit
- Air consumption decreased from 10 to 20 per cent
- Stream contour and abrasive velocity maintained

For YOU, this means

More Service per Dollar

For full details on cost-cutting NORBIDE Nozzles, write for your free copy of Form 543.

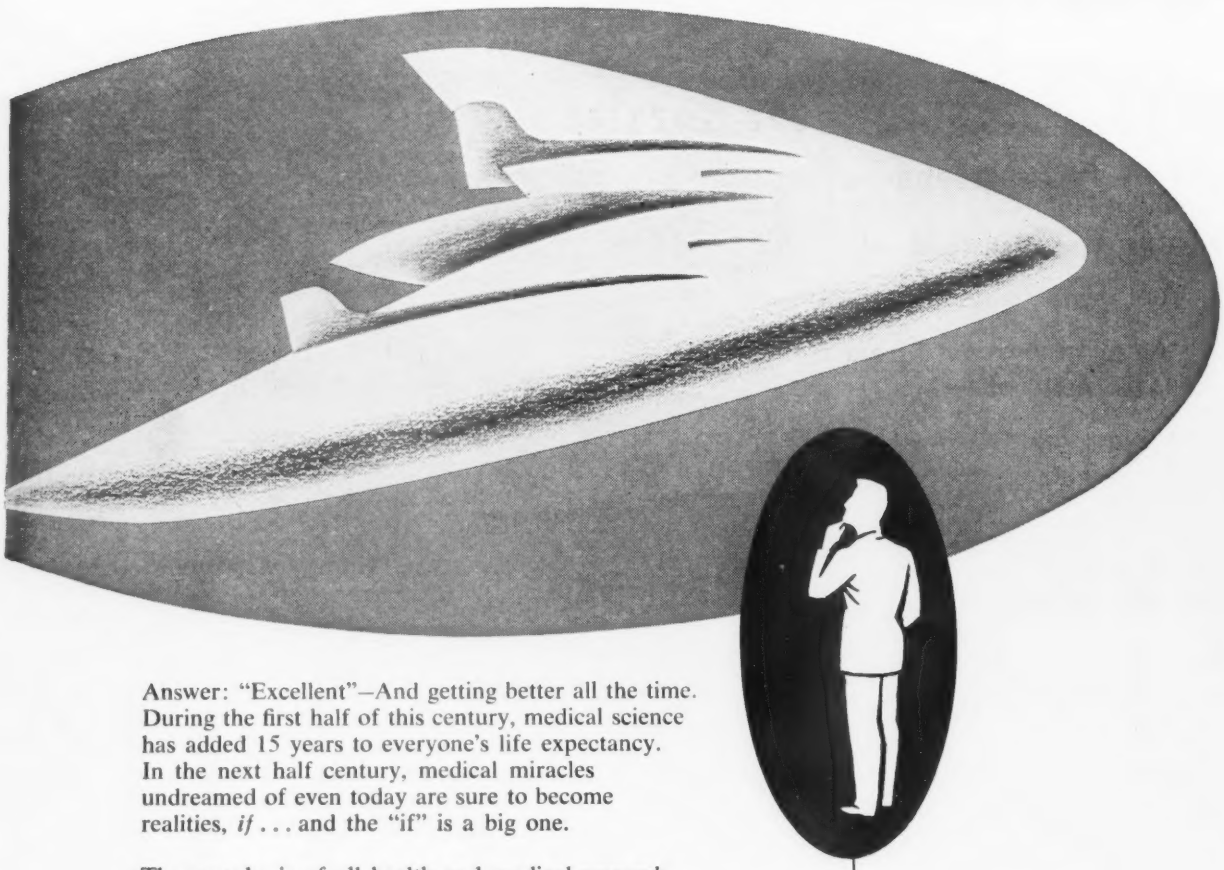
NORBIDE®... *the longest nozzle life you can buy*

NORTON
BORON CARBIDE

NORTON COMPANY
43 New Bond Street • Worcester 6, Mass.

Making better products . . . to make other products better

how are your chances of being around in 1999?



Answer: "Excellent"—And getting better all the time. During the first half of this century, medical science has added 15 years to everyone's life expectancy. In the next half century, medical miracles undreamed of even today are sure to become realities, *if* . . . and the "if" is a big one.

The very basis of all health and medical research, the foundation without which no hospital or health agency can operate, is imperiled. That foundation is the country's compact network of 79 medical schools.

The threat is real and immediate . . . the production line of well-trained doctors is seriously endangered. Lack of operating funds has reduced teaching time by 7%, created vacancies in one out of every 20 full-time teaching positions, caused three private medical schools to become state institutions within the past three years . . . and all of this at a time when demands of our expanding population and rapid scientific advances require the highest in teaching standards, and larger enrollments.

Hundreds of firms in industry have recognized this threat in its fullest implication. The contributions they are making to the National Fund constitute one of private enterprise's major services to the nation. At the same time these contributions serve as safeguards for their investments in family, community and employee health. Get full details on the crisis that faces medical education, and learn how you can help solve it.

NATIONAL FUND FOR MEDICAL EDUCATION

MEDICAL EDUCATION KEEPS AMERICA HEALTHY

FACTS YOU SHOULD KNOW ABOUT MEDICAL EDUCATION

- There are only 79 accredited medical schools in the United States.
- They train 82,000 undergraduates, specialists and technicians and graduate 6,500 doctors annually.
- It costs from $10,000 to $12,000 to train a doctor today.
- Tuition fees, raised 84% over 1940, cover less than 20% of the cost.
- In the past decade medical teaching budgets have risen 143%; administration and plant operation 150%.
- The medical schools need $10,000,000 annually in additional income to maintain present standards and train the necessary number of doctors required for America's growing population.
- *ALL* 79 medical schools can be aided by a *single* gift to the National Fund for Medical Education.
- Contributions are distributed through annual grants according to a schedule approved by the medical schools.
- The National Fund is a voluntary, non-profit organization approved and supported by the American Medical Association and the Association of American Medical Colleges.

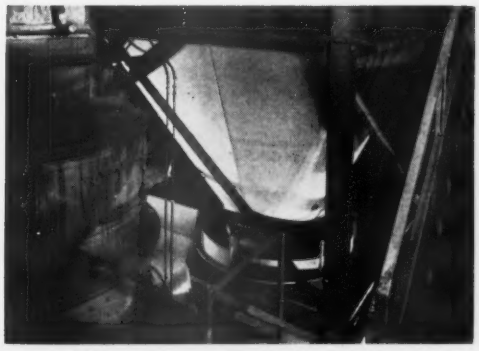
For complete facts on the crisis facing medical education write to

The National Fund for Medical Education,
2 West 46 Street, New York 36, New York

NEWAYGO SANDHANDLING SYSTEM *modernizes and mechanizes* WEST MICHIGAN STEEL FOUNDRY CO.

This is the third Newaygo Sandhandling System installed for West Michigan Steel Foundry Company in Muskegon, Michigan, over a 25-year pediod. Don F. Seyferth, Executive Vice President, states, "In the foundry business today we recognize the fact that competition demands modern equipment. This means more production through mechanization, resulting in time and labor savings, plus other cost cutting efficiencies that expert sand handling engineering can effect. Newaygo engineers did just that for us and we are more than just satisfied with the smooth, continuous, every day performance of the system. We are getting the greatest results for the least amount of dollars invested."

View from pouring floor shows specially designed molding hoppers of Stain-clad Steel with air operated gates. The unique contour of these hoppers allows the extremely "sticky" steel foundry sand to flow easily. Also shown is the mold storage end of the platen car set-out track system. After molds are poured and automatically dumped into a vibrating conveyor, mold platen cars and bottom boards are automatically returned to molder on an underneath run of track.



↑ One of two 90-ton Newaygo Shakeout Sand Storage Tanks. Newaygo Plate Feeders underneath allow uniform withdrawal of sand.

← Nineteen overhead molders' hoppers. Four serve two cope and drag floors. Fifteen serve individual squeezer molders.

A copy of "Planned Mechanization for Foundries" is yours for the asking. Write, wire, or phone today.

NEWAYGO engineering company
NEWAYGO, MICHIGAN
Manufacturers of Neway® Mold Handling, Sand Handling and Conditioning Equipment

COLEMAN OVENS

reduce waste . . . lower costs

in every type of foundry

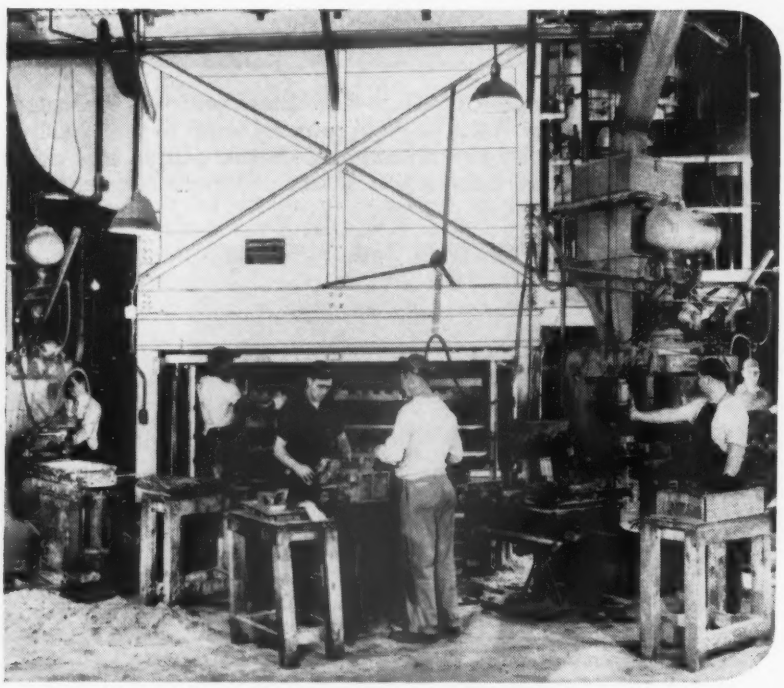
You can reduce casting scrap . . . cut your labor, material and fuel costs by baking cores and drying molds in Coleman Ovens. Small and large foundries alike find that Coleman Ovens are vital to better quality castings and increased profits.

Coleman Ovens quickly pay for themselves out of direct savings in labor, materials and reduced casting scrap.

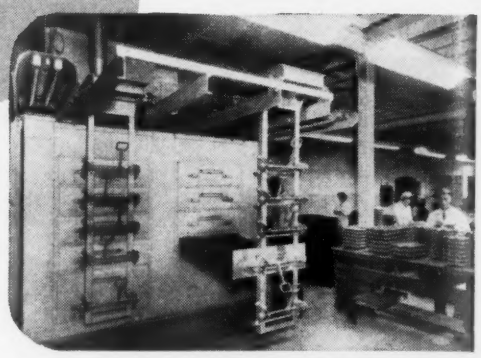
Coleman Engineers have pioneered and developed the most efficient oven designs to meet the highly specialized needs of modern foundry methods in all classes of work — grey iron, malleable, steel, alloy, brass, aluminum and magnesium.

Profit by this experience — let us recommend, at no obligation, the Coleman Oven for your needs.

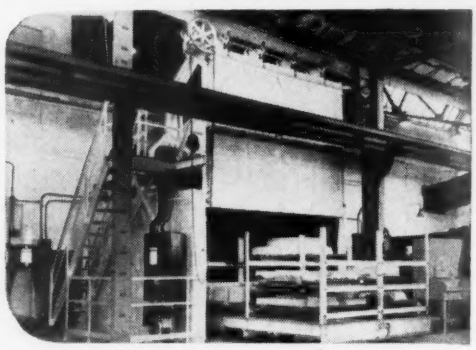
Write for Bulletin 54



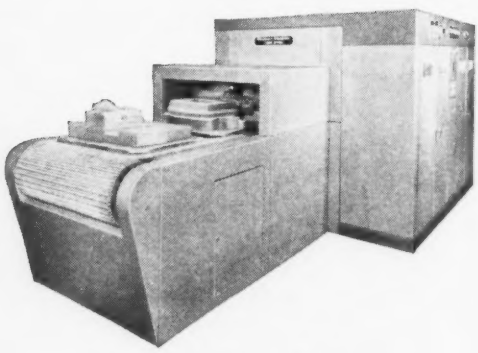
Coleman Tower ® Oven in Automotive Foundry



Coleman Rolling Drawer Ovens in Brass Fittings Foundry



Coleman Car-Type Oven in Steel Foundry



Coleman Dielectric Core Oven in Aluminum Foundry

A COMPLETE RANGE OF TYPES AND SIZES

for every core baking and mold drying requirement:

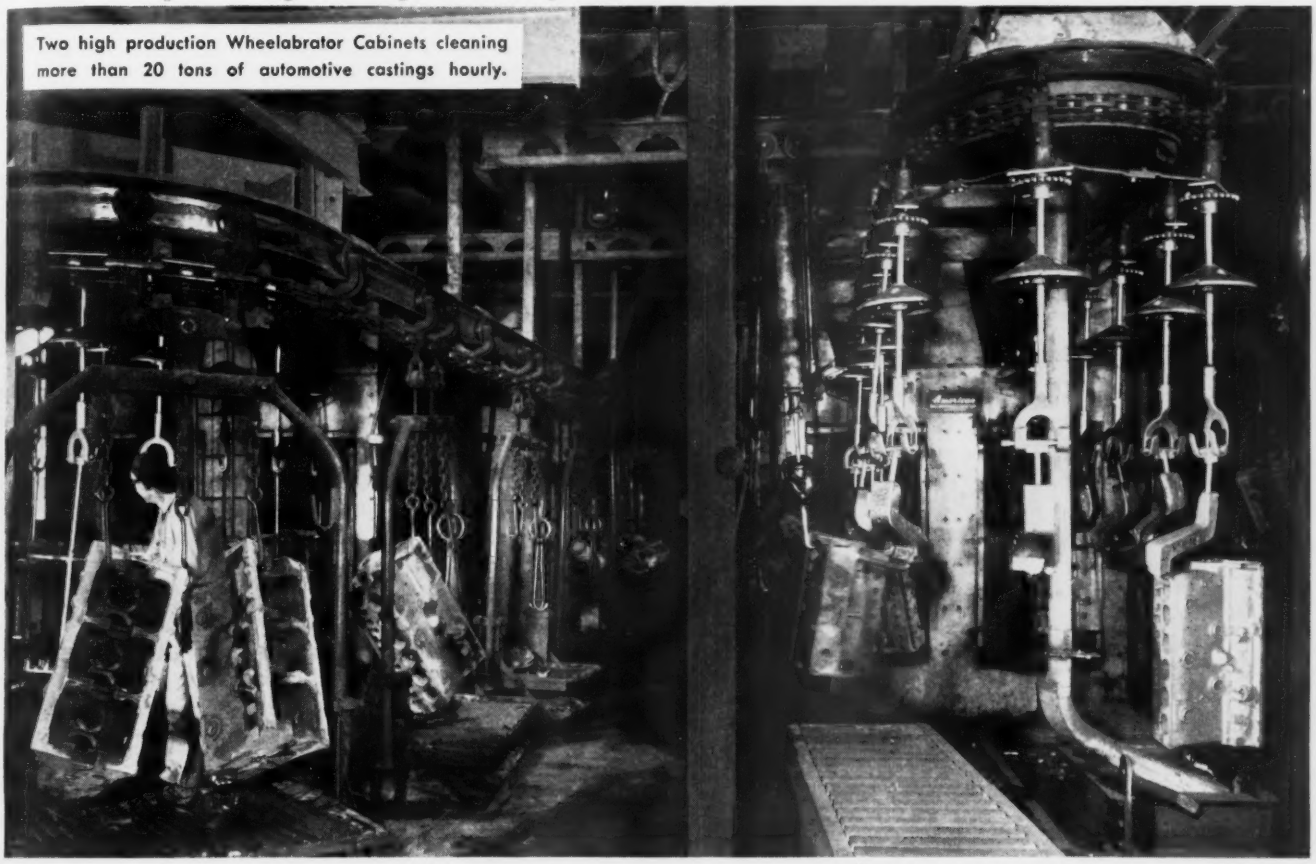
Tower Ovens • Horizontal Conveyor Ovens
Car-Type Core Ovens • Car-Type Mold Ovens
Transrack Ovens • Rolling Drawer Ovens
Portable Core Ovens • Portable Mold Dryers
Dielectric Core Ovens

MEMBER FEMA

THE FOUNDRY EQUIPMENT COMPANY
1821 COLUMBUS ROAD CLEVELAND 13, OHIO

WORLD'S OLDEST AND LARGEST FOUNDRY OVEN SPECIALISTS

pioneering developments keep WHEELABRATOR® first in blast cleaning



Two high production Wheelabrator Cabinets cleaning more than 20 tons of automotive castings hourly.

Production Lines Make Money only When They Move

Wheelabrator's Fast, Dependable Cleaning Lets Production Lines Flow At Automotive Foundry

Conveyorized production at a prominent Indiana automotive gray iron foundry ties together all production operations. A production stoppage at any point along the way would halt operations in the entire plant.

Fast, dependable cleaning performance helps keep production moving—even when cleaning equipment is in operation 22½ hours a day, the way Wheelabrator special blast cabinets are frequently operated in this foundry.

In this new foundry, two Monorail Cabinets, each equipped with four Wheelabrator airless abrasive units, clean a combined total of more than 20 tons of automotive castings hourly. In one machine a production of 170 engine blocks hourly is maintained; the second Monorail Cabinet cleans 340 engine heads or 340 fly wheels hourly.

Whenever cleaning speeds must be geared to high production schedules, Wheelabrator specially designed blast machines are the most practical and economical solution to the problem. Wheelabrator Cabinets have no peer in the number and range of their applications nor in the ingenuity with which they have been designed and engineered.

For your special cleaning problem investigate the Wheelabrator—see how it can help you speed production and effect important savings in cleaning costs. Why not take this action soon? Write today for complete information.

USE Genuine WHEELABRATOR® LONG-LYFE WEAR-RESISTING PARTS

American Wheelabrator®
AIRLESS BLAST CLEANING

WHEELABRATOR & EQUIPMENT CORP.

505 S. Byrkit St., Mishawaka, Ind.

WORLD'S LARGEST BUILDERS OF AIRLESS BLAST EQUIPMENT

Manufacturers and Selling Agents: CONTINENTAL EUROPE—George Fischer, Ltd., Schaffhausen, Switzerland; BRITISH COMMONWEALTH—Tilghman's Patent Sand Blast Co. Ltd., Broadheath, England; JAPAN—Tokyo Boeki Kaisha, Tokyo; BRAZIL and ARGENTINA—Equipamentos Industriais EISA Ltda., Sao Paulo, Brazil; AUSTRALIA—McPherson's, Melbourne; MEXICO—Casco, S. De R. L., Mexico, D. F.

SIMPSON

Porto-Mullers

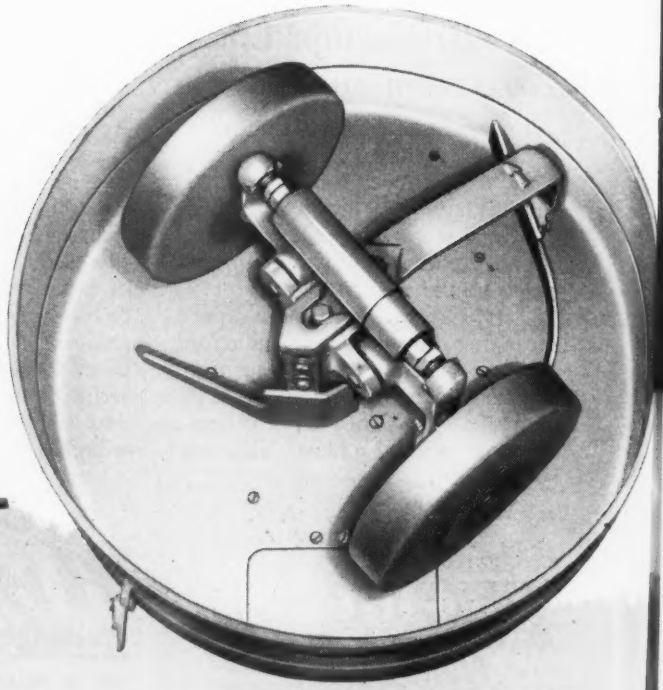
Here's a completely self-contained mixer "package" that can go anywhere in the foundry . . . to do a thorough, consistent mixing job on any kind of sand —from the toughest steel facing sand to the most intricate shell and "D" process formulations.

Designed around the practical theory that it's cheaper and easier to bring the muller to small mixing jobs than it is to haul sand to the muller. The Simpson Porto-Muller is making *real* economy possible on hundreds of jobs where makeshift mixing practices formerly took a large toll in wasted core oils, binders and extra man-hours. Many users report up to 50% savings in materials and/or manpower during the first week of operation.

Built to the same high engineering standards as all Simpson Mix-Mullers, the Simpson Porto-Muller is a favorite with foundrymen who *know* mulling. Here's why over 500 of them have been purchased in 5 short years. Here's why *any* foundry has a job for the Simpson Porto-Muller.

QUICKLY CHARGED from wheelbarrow or sand pile, the sand is handled only once. Porto-Muller tips to convenient loading height. Note dust cover and large implement type wheels.

DISCHARGE IS SIMPLE. Just open the large bottom door and *plows* do the work. Door located at proper height for wheelbarrow.



POSITIVE, CONTROLLED MIXING ACTION. Spring-loaded mullers permit easy and infinitely variable adjustment of muller pressure—permits use of light mullers, yet you can adjust to mull *any* sand.

MIX ANY TYPE OF SAND ANYWHERE IN YOUR SHOP

low cost muller brings the economy of efficiency to smaller mixing jobs

COMPARE THESE FEATURES WITH ANY MULLER AT ANY PRICE

100% PORTABLE AND SELF-CONTAINED. No hoists or ceiling supports are required. Requires little floor space and no extra wheelbarrows.

READY TO GO. Motor, starter, dust hood, 25 ft. of cable and male plug come in the mixer "package". No foundations, supports or hoists are necessary.

BIG CAPACITY. Stationary pan easily handles 250 to 300 lbs. of sand.

STANDARD MOTOR. 3 HP NEMA frame 1800 HP dust-proof motor is interchangeable.

V-BELT DRIVE. Provides efficient, positive protection against sudden overloads. Quiet smooth operation.

EASY TO HANDLE. Uses standard 6.00 x 16 implement tires and wheels. Rolls on grease packed, anti-friction bearings. Weight is well distributed . . . easily handled by one man.

TOPS FOR SHELL SAND. Positive mixing action insures thorough dispersion of resin binders, reduces segregation . . . makes Porto-Muller "standard equipment" for leaders and pioneers in shell and "D" Process.

SIMPSON MIX-MULLERS

NATIONAL

Engineering Company

646 Machinery Hall Bldg.
Chicago 6, Illinois

MAIL THIS COUPON TODAY
for full details on the Simpson Porto-Muller!

NATIONAL ENGINEERING COMPANY
646 Machinery Hall Bldg.
Chicago 6, Illinois

Send: ☐ full details ☐ quotation on the Simpson PORTO-MULLER

Name_____

Company_____

Address_____

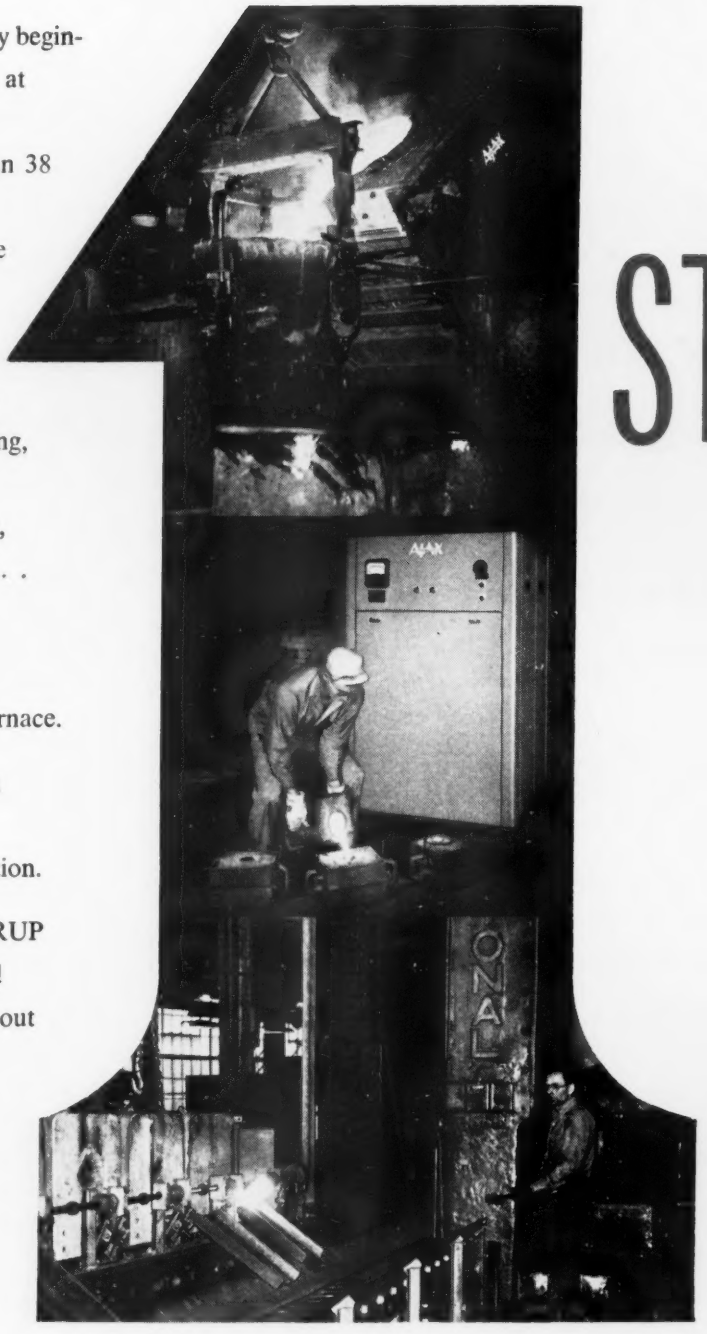
City_____ State_____

EXPERIENCE from the very beginning of induction heating and melting is at your disposal when you call on Ajax.

It is leadership which began 38 years ago with the company's introduction of the first high frequency furnace for industrial use. Since then:

- Melting . . . forging . . . surface hardening (exploited under Ajax license) . . . vacuum melting . . . making, sintering and hot pressing carbides . . . graphitizing . . . and countless other low, dual and high frequency applications . . . *all were Ajax firsts.*
- Practically every new alloy has been developed in an AJAX-NORTHRUP furnace.
- Scores of large industries have grown around the nucleus of a simple AJAX-NORTHRUP laboratory installation.
- More kilowatts of AJAX-NORTHRUP induction equipment, both converter and motor-generator types, are in use throughout the world than any other.

Ajax engineers can show you how this *experience,* which has maintained leadership over the years, can bring you important day-to-day benefits . . . in even your toughest heating or melting application. Telephone or write today.



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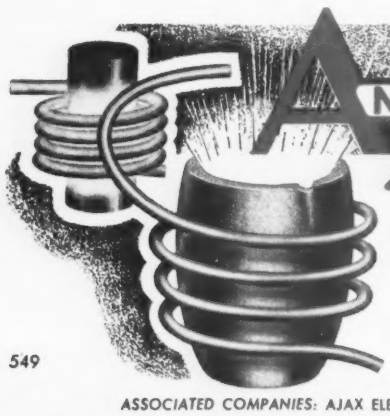


AJAX NORTHRUP SINCE 1916

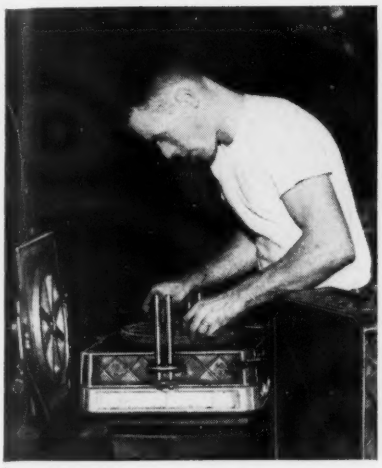
INDUCTION HEATING-MELTING

AJAX ELECTROTHERMIC CORPORATION • TRENTON 5, NEW JERSEY

549

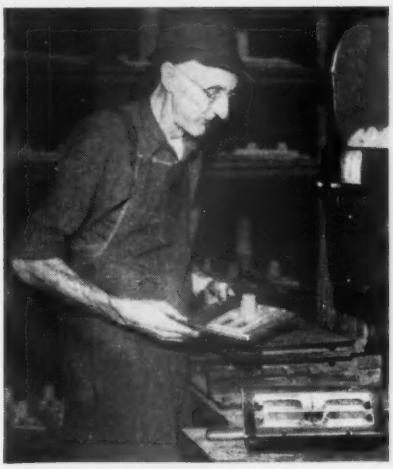
ASSOCIATED COMPANIES: AJAX ELECTRIC FURNACE CORPORATION • AJAX ELECTRIC COMPANY • AJAX ENGINEERING CORPORATION

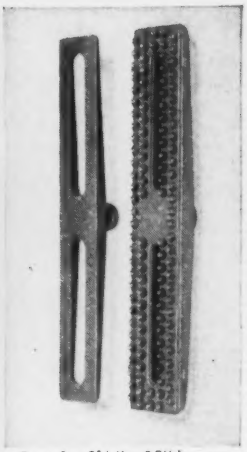
Columbiana Pump's* Picture-Story Of Just How Cities Service Delco 38 Core Oil Solved Problems For Them!



THIS IS A VENTED oil and sand core, 50:1 ratio. We were troubled with chaplet penetration into this vent until we used Delco 38 which produced a core of necessary durability, eliminating the penetration problem. (Vent hole is ⅛" below surface of core.)

Core for gas burner venturi.





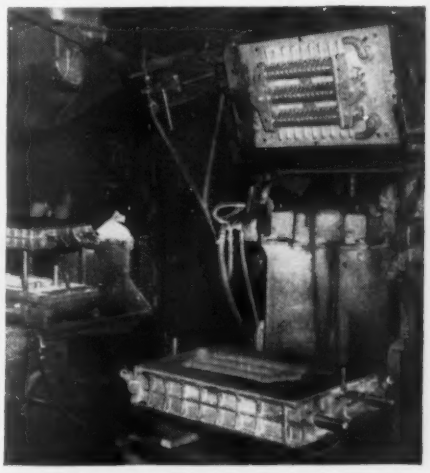
Core for 2½" x 15" burner.

BOTH THESE CORES REPRESENTED A TOUGH PROBLEM because we were forced to use rod and wire strengtheners with our previous core oil.

When we switched to Delco 38, we were able to make our venturi casting (left) using wires only in the smallest sections. When we used Delco 38 for our burner core (right), we were able to eliminate both wires and rods since Delco 38 itself had the required strength. WE ACTUALLY DOUBLED OUR PRODUCTION OF THESE BURNER CASTINGS! In addition, we saved the time required to place wires and rods in cores, and we saved the cost of these materials too!

THIS LARGE AND HEAVY CORE must withstand extreme temperature and a metal thickness of 6 to 8 inches. Delco 38 performed as well with this 1000 lbs. casting as in a small core. DELCO 38 BURNS OUT READILY AFTER CASTING, CREATES NO REMOVAL PROBLEM!

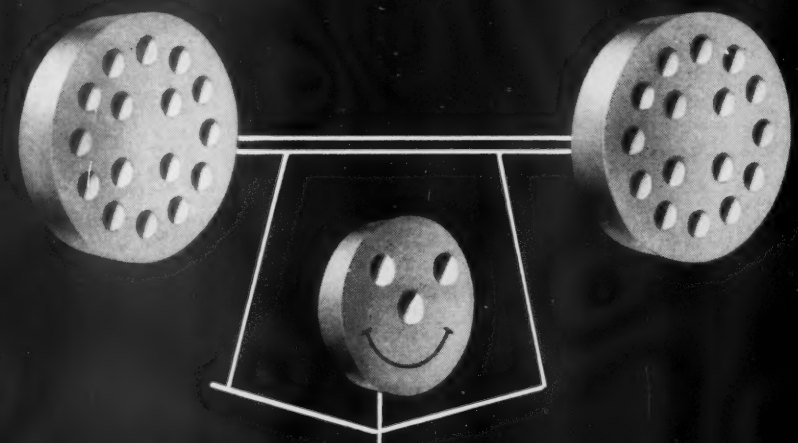
IN THIS CHAIN SHEAVE CASTING, it's particularly important that the corners be sharp and tough so they won't break or rub away. Delco 38 gives us a core with sharp corners which produce a perfect pocket in the sheave which carries the chain.



DELCO 38 IS USED in this boiler section oil sand core and again NO RODS OR WIRES ARE REQUIRED FOR REINFORCEMENT! Also, Delco 38 gives off a minimum of gas which is very desirable when making precision smooth surface castings.

Our thanks to the Foundry Division of Columbiana Pump Co., Columbiana, Ohio

CITIES SERVICE
QUALITY PETROLEUM PRODUCTS



This growing 6-year-old has been given a new name

Louthan

Co-developers (with Harbison-Walker) of

REFRACTORY STRAINER CORES

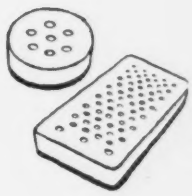
REPRESENTATIVES: **FREDERIC B. STEVENS, INC.,** 1800 18th St., DETROIT, MICH.; 17 N. Glenwood Ave., ALDEN, PA.; 4036 Belle Grove Rd., BALTIMORE 25, MD.; 93 Stone St., BUFFALO 12, N. Y.; 6441 N. Seeley, CHICAGO 45, ILL.; 1940 E. 6th St., CLEVELAND, OHIO; 3367A Broadmoor, COLUMBUS 13, OHIO; 1504 Lawndale Rd., ELKHART, IND.; 654 W. 8th St., ERIE, PA.; 434 Delia St., FLINT, MICH.; P. O. Box 154, FRAMINGHAM CENTER, MASS.; 149 Euclid, HAMBURG, N. Y.; P. O. Box 243, HAMILTON, OHIO; 4000 E. 16th St., INDIANAPOLIS, IND.; 519 71st St., KENOSHA, WISC.; 168 Brewery St., NEW HAVEN, CONN.; P. O. Box 894, PEORIA, ILL.; 625 W. Huron St., PONTIAC, MICH.; 141 Harvest Dr., ROCHESTER 13, N. Y.; 257 Dayton Rd., TRUMBULL, CONN. . . . **MISSOURI REFRACTORIES CO.,** 4599 Pacific Blvd., LOS ANGELES 58, CALIF. . . . **FOUNDRY SUPPLY CO.,** 5009 Excelsior Blvd., MINNEAPOLIS 16, MINN. ***IN CANADA:*** **FREDERIC B. STEVENS OF CANADA, LTD.,** 41 Dovercourt, TORONTO 1, ONT.; 1262 McDougall St., WINDSOR, ONT.

Facts you should know about

LOUTHAN REFRACTORY STRAINER CORES

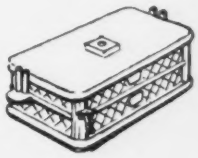
The product

Louthan perfected and made the *first* successful refractory strainer cores. While marketed up to now by Harbison-Walker, all have been *made by Louthan*, a former subsidiary of "H-W". All Louthan Cores are made of a high-strength ceramic material having a low thermal expansion. All are precision formed and kiln fired. All are *guaranteed* to withstand pouring temperatures up to 3,000° F. without spalling or eroding—a great help in producing better, cleaner castings at lower costs.



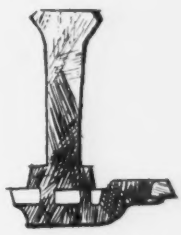
Its uses and advantages

Used by leading foundries in the making of *nearly ten million* castings last year, Louthan Refractory Strainer Cores pay for themselves many times over. Easily inserted in the drag, they closely control the flow of metal, keep slag and sand-core inclusions out of castings, save needless grinding and rejects, permit users to work to closer tolerances, often eliminate the need of costly gating systems.



Performance standards; sizes and shapes

High in thermal shock resistance (*will withstand immersion in 3,000 degree molten steel for 25 seconds without spalling or disintegrating*). Louthan Cores are exceptionally uniform, dimensionally accurate, no flash in openings, easy to handle and use. Available in seven standard sizes (ranging from 1¾″ to 3½″ in diameter), also in special sizes and shapes to meet your specific requirements.

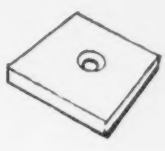


Sales representation

Louthan Strainer Cores will be distributed and sold by leading *foundry supply houses* exclusively. Their knowledge of your business should be helpful in your making the best use of these refractory strainer cores. These jobbers will also carry stocks for your added convenience.

Louthan Refractory Breaker Cores

A joint development of Louthan, H-W and the Steel Founders Society, these breaker core shapes are saving time and money for a growing number of steel casting producers. Scientifically designed for just the right amount of heat conductivity needed for perfect castings. Available in a wide range of sizes.



TEST LOUTHAN CORES IN YOUR OWN FOUNDRY!

See your nearest Jobber or write us for free samples!

FERRO

THE LOUTHAN MFG. CO.

(Subsidiary of Ferro Corporation) East Liverpool, Ohio

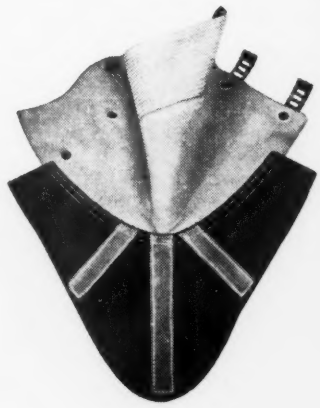
Foot and Leg Protection

It's Foot-Snug . . . Always!

NEW AO SPAT with special flare

gives greater safety

OUTSIDE VIEW



INSIDE VIEW

You're looking at a new idea in spats — featuring three stays instead of a spring clip on the flare. We developed this for very hot jobs where curling up of the flare is a hazard. The stays on this new spat (AO 7X171) *keep the front of the flare snug against the foot despite intense heat* — always. Your nearest AO Safety products Representative can supply you.

QUICK FACTS

- Chrome tanned cowhide
- Elastic top for snug fit
- Buckle and strap go under shoe to hold oak tanned leather flare
- Leg portion held in place by two arctic buckles in rear and two snap fasteners at top
- Protects instep and ankle, prevents sparks and molten metal from rolling down inside shoe tops
- If spring clip is desired instead of steel stays, ask for AO Spat 7X129

American Optical
SAFETY PRODUCTS DIVISION

The SAFETY ZONE

Keep your workers in the Safety Zone with AO Safety Equipment

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

Pangborn Blastmaster® Barrel

SAVES $1,500 A MONTH

for Specialty Aluminum and Bronze Corp.

The owners of Specialty Aluminum and Bronze Corp.—a non-ferrous jobbing foundry in Revere, Mass. — are completely sold on their Blastmaster Barrel. Not only does the machine clean practically the entire production of the foundry, but careful records show that it saves $1,500 a month!

This saving is due partly to the high quality cleaning which discloses casting imperfections early and saves hours of further processing. In addition, the Blastmaster operates quickly, cleaning loads up to 500 lbs. in 5 to 6 minutes. Maintenance costs are "extremely reasonable" and Specialty uses Malleabrasive* to lower cleaning costs even more. Concerning the Blastmaster's patented steel mesh door, President J. C. Duggan says: "It is excellent —really abrasive-tight and a really worth-while feature of this machine."

*U. S. Patent 2184926 (others pending)

The Pangborn Blastmaster Barrel can cut cleaning costs for *you*. For faster, better cleaning, investigate the Blastmaster. In 1½, 3, 6, 12, 18 and 27 cu. ft. capacities. Write for Bulletin 225 to: PANGBORN CORPORATION, 1400 Pangborn Blvd., Hagerstown, Md.

Look to Pangborn for the latest developments in Blast Cleaning and Dust Control Equipment

Pangborn BLAST CLEANS CHEAPER

WITH THE RIGHT EQUIPMENT FOR EVERY JOB

Practically here!
Shell-Mac III
Shell Mold and Core Blowing Machine
The only high production shell molding machine that will give a contoured back with controlled thickness

You saw the fore-runner of this new model at the 58th Annual Foundry Congress . . . now Shell-Mac III is practically ready to take its place among the foundry "greats" — an improved means of producing shell molds having unique advantages at a greater production economy.

Shell-Mac III will produce shell molds with contoured backs and controlled thickness. This will permit stack molding or pouring off without the use of clamps, fixtures, paste, staples, steel shot or other backup materials. Molds can also be poured in a horizontal plane using conventional foundry weights.

For faster, higher quality shell molds at less production time — watch for the introduction of Shell-Mac III!

Shell-Mac Engineering Co.

724 Cresson Road, Ebensburg, Pa.

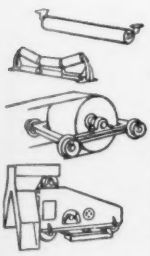
Carry the load via Link-Belt belt conveyors... SEE YOUR COSTS GO DOWN

LINK-BELT offers you the "total engineering" so necessary for top efficiency

DESIGNED FOR OVERALL EFFICIENCY

Because of its unrivalled experience, Link-Belt can do a better job of gathering and analyzing all data. Proposals reflect this understanding of the most practical way to fit conveyors into your overall system requirements.

BUILT FOR LONG-LIFE PERFORMANCE



Link-Belt manufactures all components and related feeders and conveyors. You are assured of the right equipment because of this breadth of line. And Link-Belt will supply the highest grade belts engineered to the job.

DELIVERS FULL RATED CAPACITY

Link-Belt follows through on every detail of the job, including electrical controls and even wiring and foundations. What's more, Link-Belt will furnish experienced erection superintendents, staffs and skilled crews if desired.

ASSURE SATISFACTORY PERFORMANCE

When you rely on Link-Belt as a single source for your complete system, Link-Belt accepts responsibility for placing it in full operating readiness. We will also supervise modernization of existing systems.

Prepared sand is quickly distributed to molders' hoppers by this Link-Belt flat roll belt conveyor. Troughed idlers employed for other sand handling.

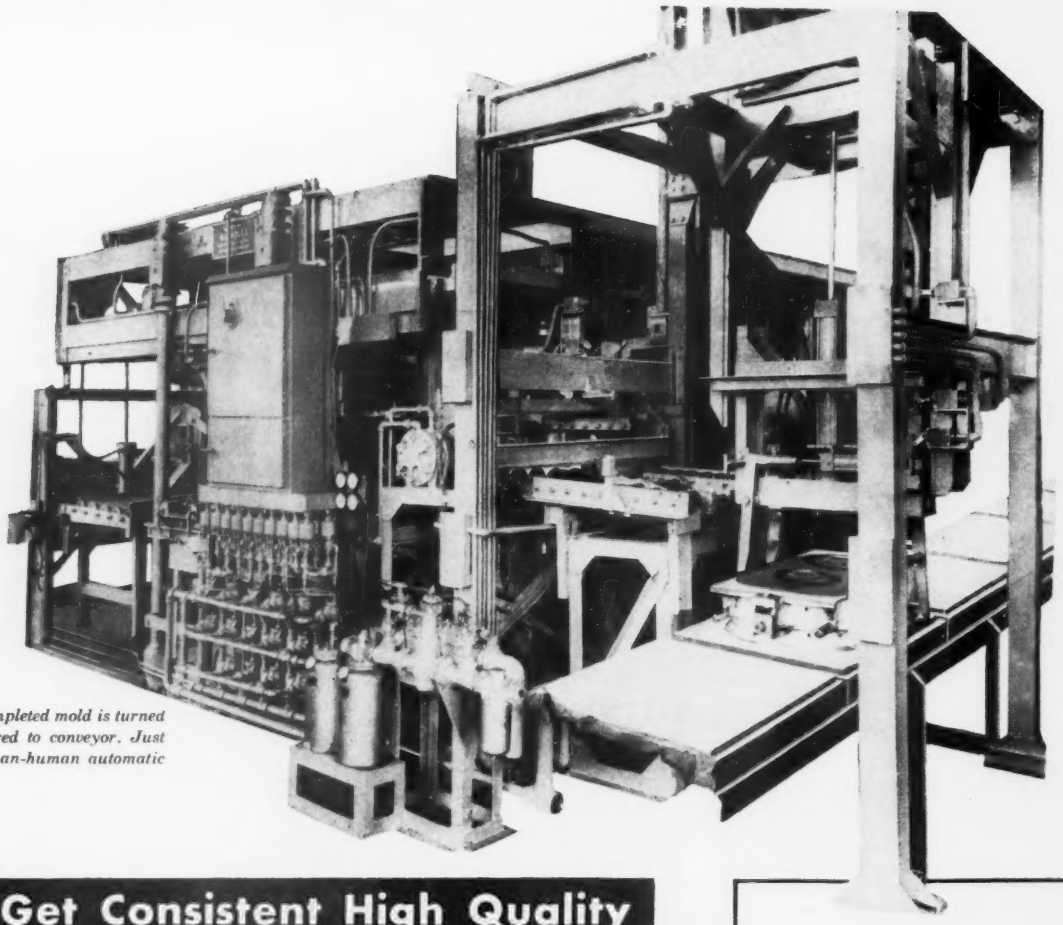
WHETHER it's a single belt conveyor or a complete system, there's no substitute for Link-Belt equipment and Link-Belt engineering. Call the district sales office near you for all the facts on this unique single-contract service.

LINK-BELT

BELT CONVEYOR EQUIPMENT

LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.

13,467-C



Automatically, completed mold is turned over and transferred to conveyor. Just one of the better-than-human automatic operations.

You Get Consistent High Quality with Nicholls Fully-Automatic Push-Button Molding Machines

Get a continuous flow of molds—better molds. Eliminate money-squandering risk and error. Our new No. 24 Type C heavy-duty molding machine culminates almost 50 years of experience to give you better molds at a lower cost—automatically. And automatically, profits increase as costs of production and materials decline—thanks to Nicholls. Write us for details about Nicholls heavy duty molding machines.

Cost sheets too, are in better shape, when you mold on Nicholls machines.

Now Study These Cost-Cutting Advantages

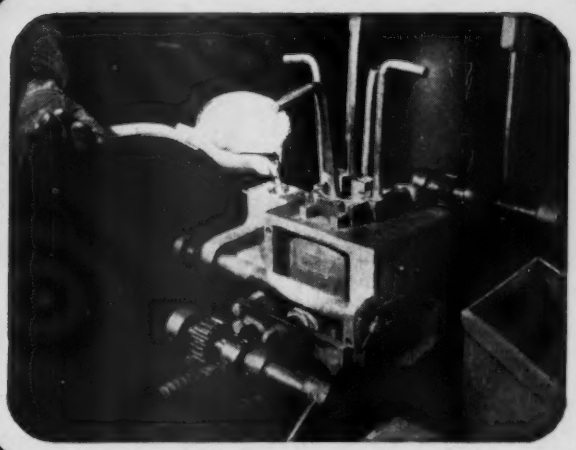
- Pneumatic Pattern Draw.
- Air-Operated Car-Type Squeeze Head.
- Built-in Flask, Roll-in, Roll-out Device.
- Sand Hopper That Measures.
- Flask Feed-in Elevator.
- Flask Indexing Device.
- Sand Spill Upset.
- Mold Turnover and Transfer.

WM. H. NICHOLLS CO., INC., Richmond Hill 18, Long Island, N. Y.

NICHOLLS

telling the story of 'dag' dispersions

Here is a Better Parting Compound ...No Smoke at Any Temperature



It's a 'dag' dispersion... a material that's first of all a friction-fighting, heat-beating mold wash. Spray it on, paint it on, apply it by dipping. Molds, patterns, chills, cores... even push pins, shoulder screws, flask pins, and ladle interiors... they'll all take on a microscopically thin, slippery, *dry film,* that will banish sticking for good.

Try 'dag' dispersions. Parting will be quicker, castings will be smoother, than with any other parting agent. Binding and stripping will be eliminated. Chills will tap off easily without damage to casting surfaces.

As an added benefit, water dispersions of 'dag' Colloidal Graphite get rid of the irritating smoke caused by most parting compounds.

You can learn more about 'dag' parting compounds by asking for Bulletin No. 425-K3.

Dispersions of molybdenum disulfide are available in various carriers.

We are also equipped to do custom dispersing of solids in a wide variety of vehicles.

dag DISPERSIONS

Acheson Colloids Company, Port Huron, Mich.

...also ACHESON COLLOIDS LIMITED, LONDON, ENGLAND

y resin-bonded dry graphite films for permanent lubrication

everything you want in a

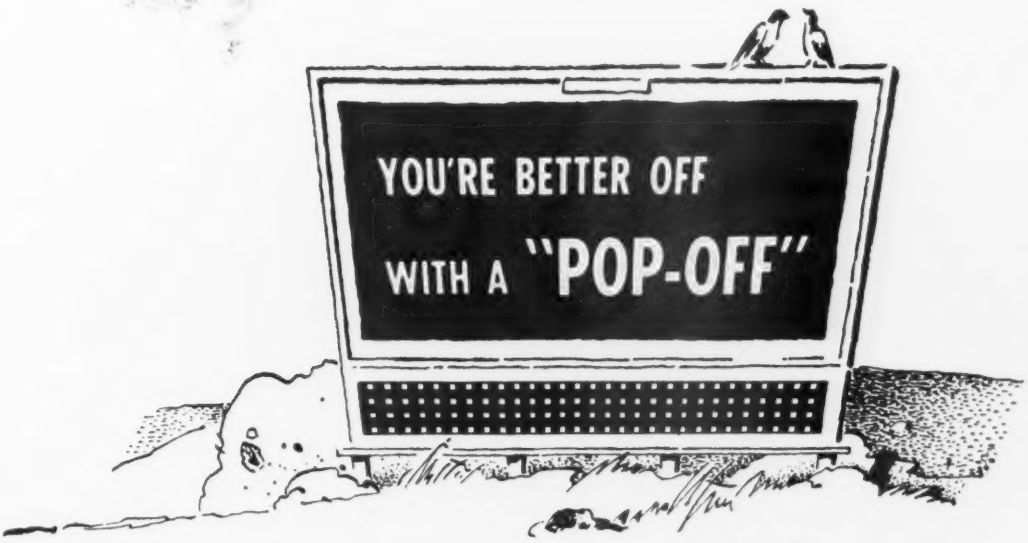
HINES
POP-OFF
FLASK
MEMBER
FEMA

THE

We've been making flasks, now, for thirty years and during all that time, have continually tried to incorporate in them all the things foundrymen have demanded in a flask. First, there's rugged

FLASK

construction — so you'll get long, trouble-free service. Secondly, they're designed for peak performance — so you'll get better molds and minimum scrap. Next, our flasks have definite mechanical advantages — reinforcing ribs outside, waffled surface inside, plus the exclusive "POP-OFF" feature. Finally, there's real economy in our flasks — for they last longer and produce more perfect molds. So, when you're looking for a flask to give you better molds, faster, more economically, always remember . . .



EHINES FLASK CO.

3431 WEST 140TH STREET • CLEVELAND 11, OHIO • PHONE ORCHARD 1-2806

Every Crack Has a Cause!

Inspection with MAGNAFLUX* at the *RIGHT* times

- Finds the Cause
- Suggests the Remedy
- Reduces Rejects
- SAVES YOU MONEY
- BUILDS NEW BUSINESS

Crack as revealed by Magnaflux in the end-bell casting on an electric motor. Crack is the result of improper handling.

Not *all* cracks are serious. It depends upon the type, size and location. But in the few areas where stress is high, even a tiny crack can be important, because it raises the stress still further.

The *right* time to find cracks is when they *first* occur. This may be anywhere from pilot run to handling for shipping. Wherever it is, sampling inspection with Magnaflux finds and clearly marks the defect to point to the cause.

By finding serious defects early in processing, you can determine *where* they occur and how to correct them — before parts are run in quantity and later rejected. Correction often involves only a minor change in design or feeding procedure, or in cleaning or handling, with each change checked by Magnaflux in pilot runs. This results in a production run with almost no rejection due to cracks. It leads to castings with even stress flow, that are cheaper to pour, lighter, stronger and better looking.

With RELIABLE castings cheap to make, many foundries that use inspection with Magnaflux are now selling castings where formerly more costly forgings and weldments were used.

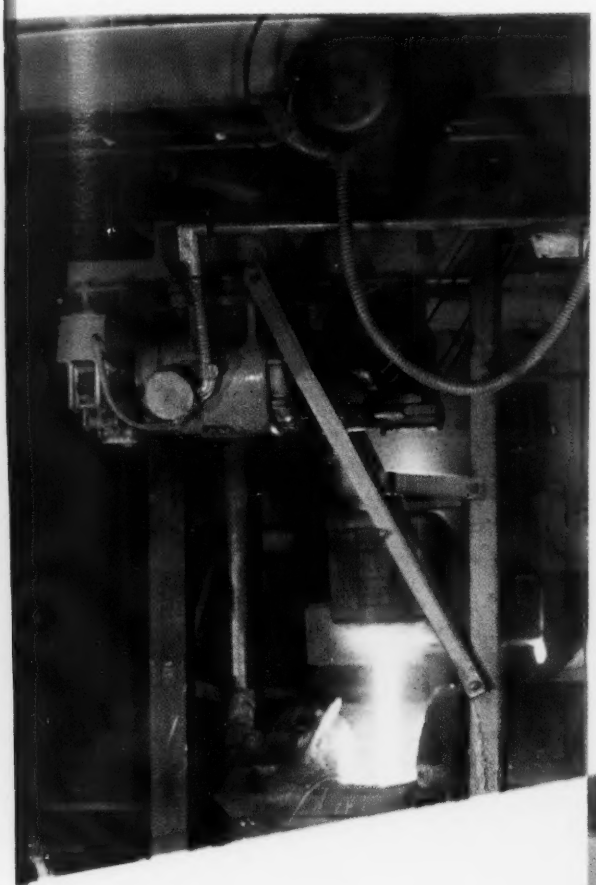
Find out now how inspection with Magnaflux can help you produce better castings, at lower cost to a bigger market! Ask to have a Magnaflux Engineer call and give you the facts.

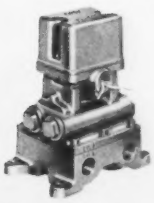
*Magnaflux is a Registered Trademark of Magnaflux Corporation

MAGNAFLUX

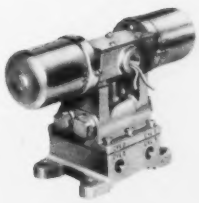
MAGNAFLUX CORPORATION
7350 West Lawrence Ave. • Chicago 31, Ill.
New York 36 • Pittsburgh 36 • Cleveland 15
Detroit 11 • Dallas 19 • Los Angeles 58

Complete Line of Ross Air Valves for Simpler Maintenance . . . Less Cost

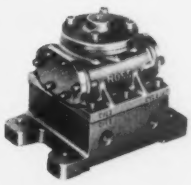




Dustproof single solenoid valve.
3-way or 4-way. Base mounted.

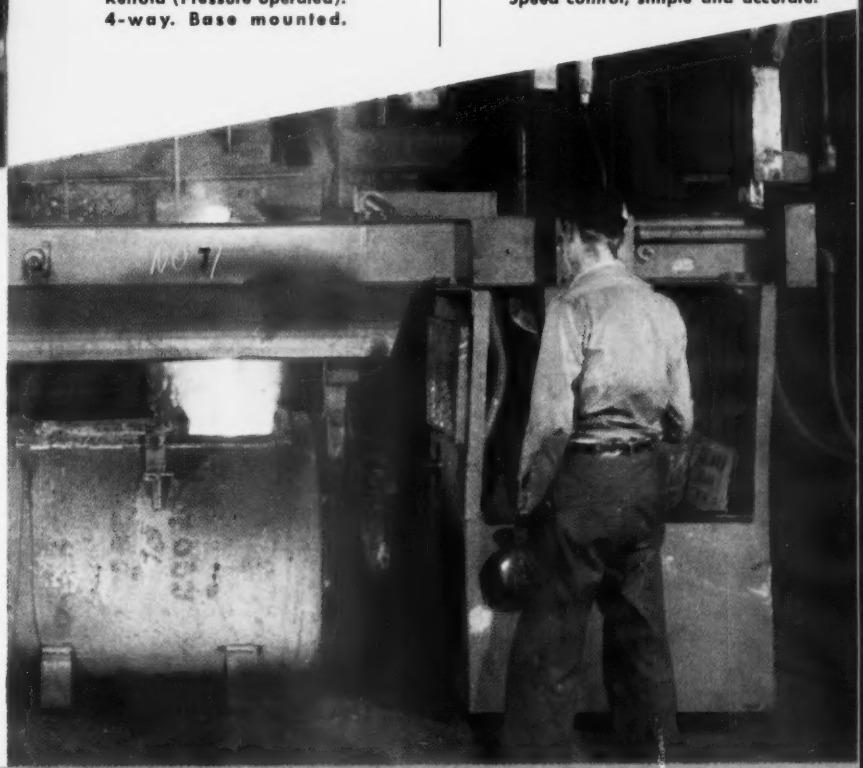


Dustproof momentary solenoid valve.
3-way or 4-way. Base mounted.



Retroid (Pressure operated).
4-way. Base mounted.

Speed control, simple and accurate.



Prompt, Expert Engineering Service—
Around the World

Thousands of Standard Types in 1/8" to 2" Pipe Sizes

Ask Your Nearby Ross Representative to Acquaint You with the Complete Ross Valve Line for Foundries

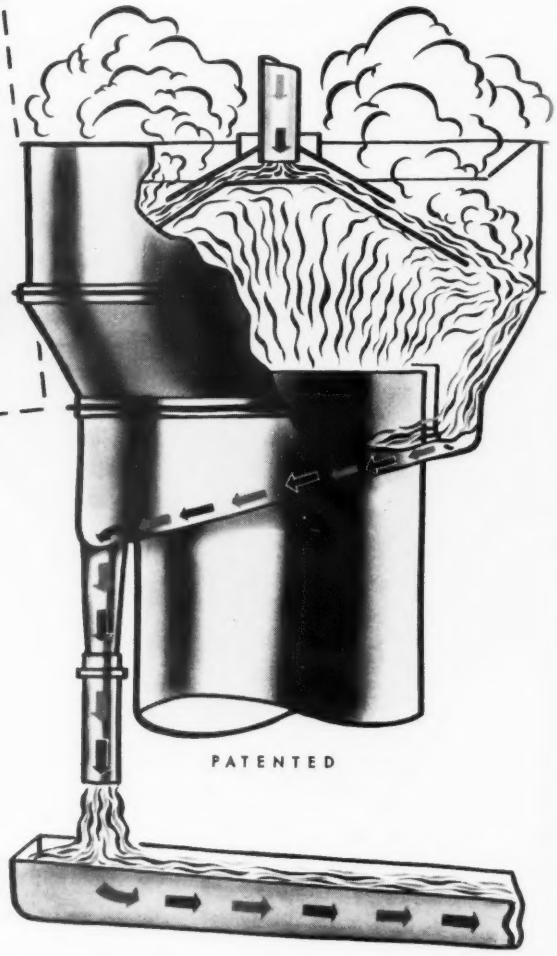
ROSS Control VALVES

Ross OPERATING VALVE COMPANY

120 E. GOLDEN GATE AVENUE • DETROIT 3 • MICHIGAN

Years ahead in features that favor your budget-

"SW" CUPOLA COLLECTORS



Budget conscious foundry management has singled out Schneible for dollars and cents value in cupola fly-ash control equipment. Wherever you are, note the cupolas that are capped with "SW" Cupola Collectors. Large and small producers alike agree they do the job *better for the least.*

Schneible patented "SW" Collectors have eliminated endless man-hours of clean-up work to protect expensive facilities from deterioration and more than paid their installation in savings on plant maintenance costs.

Better employee and public relations and more over-all productivity are added benefits enjoyed by foundries equipped with these efficient Cupola Collectors.

Latest Bulletin 554 covers in detail many more *plus* features, arrangement and helpful test data. Request your copy today without obligation. We will arrange a tour of Schneible equipped foundries in your area for interested prospective buyers.

★ SIMPLICITY
★ ACCEPTABILITY*
★ FLEXIBILITY
★ EFFICIENCY
★ DEPENDABILITY
★ LONGEVITY

*Meets all Industrial Pollution Codes (except one).

CLAUDE B. SCHNEIBLE COMPANY
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FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

Write for Bulletin 554 without obligation

SCHNEIBLE

LATE NEWS

SEPTEMBER 27 1954

LOOKING UP: Business generally is showa normal seasonal pickup, the National Association of Purchasing Agents says in its September report. Improvement over August is in contrast to the downward trend of a year ago. New orders and production increases outweigh decreases 3 to 1 in the reports, with order gains better than those in production. Prices show more strength and stability. Inventories are lower and tending to level off. Employment is up and expected to rise further in October. Buying policy stays conservative—60 days and under —but future coverage is slightly more active.

CLOSING PLANT: Bohn Aluminum & Brass Corp. plans to close its Detroit No. 1 plant at 2512 E. Grand Blvd. by early next spring. The move is said to result from the company's decision to go out of the aircraft bearing business, although certain operations will be shifted to a plant in Greensburg, Ind. Bohn, which operates foundries at two other plants in Detroit, produced permanent mold brass castings at the No. 1 plant.

MORE MERCHANT IRON: American Steel & Wire Co. lighted its new blast furnace at Cleveland on Sept. 23. This stack will increase the supply of merchant pig iron available to foundries of the area by 1350 tons a day. It brings total merchant iron capacity of Steel & Wire's Central Furnaces there to about one million tons annually.

ACQUIRES COMPANY: Continental Foundry & Machine Co. has acquired the bar and tube machinery line of the Medart Co., St. Louis. Engineering and sales offices for these products will be located at Continental's Pittsburgh headquarters. Patterns and manufacturing machinery are being transferred to Continental's Wheeling, W. Va., plant.

ALLOY PRICES: Price increases on some silicon alloys and special alloy products have been made by Electro Metallurgical Co., Division of Union Carbide & Carbon Corp., effective Sept. 1 Advances include 1.2 cents a pound on 50 per cent ferrosilicon and 0.45-cent on silicon briquets. As of the same date standard ferromanganese was reduced 0.50-cent a pound and ferromanganese was cut 0.4-cent. Higher prices reflect increases in wages and cost of certain raw materials, the company said.

BUYS INTEREST: Olin Mathieson Chemical Corp. has bought a substantial interest in Hunter Engineering Co., Riverside, Calif. Hunter now is building a plant for research and development in the casting, rolling, forging, extrusion and fabrication of aluminum.

UK BUSIER: Output of iron castings in the United Kingdom during the first half of this year increased 1.7 per cent over the 1953 period to 1,892,000 tons, according to the Council of Ironfoundry Associations. Heavy pipe accounted for 364,108 tons, up 3.9 per cent. The 146,530 tons of automotive castings produced showed a 12.8 per cent increase. Employment in iron foundries this July totaled 139,000.

PURCHASING DIRECTORY: A list of some 4000 classes of commodities purchased by the government has been published by the Small Business Administration. It's the *U. S. Government Purchasing Directory*, available for 50 cents from the Superintendent of Documents, Washington 25. It also tells who buys what, and where.

NEW OWNER: Vulcan Iron & Engineering Ltd., Winnipeg, Man., subsidiary of Bridge & Tank Co. of Canada Ltd., Hamilton, Ont., has acquired Manitoba Steel Foundries Ltd., Selkirk, Man. Foundry operations will be concentrated in the Selkirk plant.

TITANIUM PLANT: A $31½ million plant for production of at least 7500 tons of titanium metal a year is to be built at Ashtabula, O., by Electro Metallurgical Co., division of Union Carbide & Carbon Corp. The government has agreed to buy for a five-year period that

part of the plant's output not sold to private industry. The new process Electromet will use involves sodium reduction of titanium tetrachloride. Production of titanium in this country has grown from only 3 tons in 1948 to an estimated 5000 tons this year.

COPPER SUPPLY: The U. S. annual supply of new copper will be increased by at least 25 per cent between 1952 and 1956, according to the Copper & Brass Research Association. This 300,000-ton addition will result from completion of expansion projects started by copper mining companies the last two years.

PERSONALS: John M. Robb Jr., for many years resident manager at Philadelphia for Hickman, Williams & Co., has become vice president of Pennsylvania Foundry Supply & Sand Co. . . . Frederick R. Gruner, recently with Allis-Chalmers Mfg. Co., Milwaukee, has been appointed vice president in charge of operations of Warren Foundry & Pipe Corp., New York.

CASTING CLINIC: A series of one-day casting clinics for nonferrous foundrymen in the New York and Philadelphia areas is planned by Federated Metals Division, American Smelting & Refining Co. The first will be held Oct. 13 at the ASR research building in South Plainfield, N. J. Details may be obtained from Federated at 150 St. Charles St., Newark, N. J.

MISCELLANY: Cooper Alloy Foundry Co., Hillside, N. J., producer of stainless steel castings and manufactured products, has changed its name to the Cooper Alloy Corp. . . . Freight car builders delivered 2297 new cars in August, against 1801 in July and 5557 a year ago. August orders for 2425 cars left backlogs on Sept. 1 at 13,013 . . . H. L. Judd Co., Wallingford, Conn., has been sold to the Stanley Works, New Britain, Conn., subject to approval by the former's stockholders . . . Enterprise Foundry Inc., Oklahoma City, Okla., plans to build a new $50,000 foundry and office building in a new industrial district of that city . . . August production of primary aluminum totaled more than 125,000 tons, against 110,500 tons a year ago. Output for the first eight months increased nearly 150,000 over the 1953 period.

PRICES OF FOUNDRY METALS AND COKE (As of Sept. 27, 1954)

FOUNDRY COKE

(Per net ton, f.o.b. ovens)

BEEHIVE	
Connellsville	$16.50–17.00
OVEN	
Birmingham	$22.65
Buffalo	25.00
Chicago	24.50
Detroit	25.50
Erie, Pa.	25.00
Everett, Mass.	23.50
Indianapolis	24.25
Kearney, N. J.	24.00
Lone Star, Tex.	18.50
Milwaukee	25.25
Montreal, Que.	26.25
Painesville, O.	25.50
Philadelphia	23.00
Portsmouth, O.	24.00
St. Louis, del.	26.00
St. Paul	23.75
Swedeland, Pa.	23.00
Terre Haute, Ind.	24.05

PIG IRON

(Per gross ton f.o.b. furnace)

	No. 2 Foundry	Malleable
Bethlehem, Pa.	$58.50	$59.00
Birmingham	52.88	....
Buffalo	56.50	57.00
Chicago	56.50	56.50
Cleveland	56.50	56.50
Everett, Mass.	61.00	61.50
Fontana, Calif.	62.50	....
Geneva, Utah	56.50	....
Granite City, Ill.	58.40	58.90
Lone Star, Tex.	52.50	52.50
Neville Island (Pittsburgh)	56.50	56.50
Steelton, Pa.	58.50	59.00
Swedeland, Pa.	58.50	59.00
Toledo, O.	56.50	56.50
Troy, N. Y.	58.50	59.00
Youngstown, O.	....	56.50

NONFERROUS INGOT

(Cents per pound, carlots)

BRASS AND BRONZE: Red brass, No. 115, 27.00; tin bronze, No. 225, 39.00; No. 245, 33.25; high-leaded tin bronze, No. 305, 31.50; No. 1 yellow, No. 405, 23.25; manganese bronze, No. 421, 26.75.

ALUMINUM: 99 per cent plus, primary ingots 22.2. Secondary No. 12 alloy 19.75-20.25. Deoxidizing grades: No. 1 21.00-21.50; No. 4 18.00-18.50.

MAGNESIUM: 99.8 per cent notched ingots 27.75, f.o.b. Freeport, Tex. (10,000 lb or more).

COPPER: Electrolytic 30.00, delivered Connecticut valley.

ZINC: High grade 12.85, delivered. Die casting alloy 15.50, delivered.

IRON AND STEEL SCRAP

(Consumer prices per gross ton delivered, except as otherwise noted)

	No. 1 Heavy Melting Steel	No. 1 Cupola Cast	Heavy Breakable Cast	Clean Auto Cast	Machinery Cast	Malleable	Short Steel Rails
Birmingham	$23.00–24.00	**$45.00–46.00	.....	.....	.....	.....	$39.00–40.00
Boston*	**19.00–20.00	**29.00–30.00	.....	.....	**32.00–33.00	.....	.....
Buffalo	28.00–29.00	**35.00–36.00	.....	.....	**39.00–40.00	.....	40.00–41.00
Chicago	29.00–31.00	35.00–36.00	.....	39.00–40.00	39.00–40.00	40.00–42.00	45.00–47.00
Cincinnati*	**25.50–26.50	**38.00	**35.00	.....	**44.00	.....	**44.00–45.00
Cleveland	30.00–31.00	41.00–42.00	25.50–26.50	43.00–44.00	42.00–43.00	41.00–42.00	43.00–46.00
Detroit*	**23.00	**33.00	**23.00	**37.00	.....	**28.00	.....
Los Angeles	20.00	**42.00–44.00	.....	.....	.....	.....	.....
New York*	21.00–21.50	29.00–30.00	.....	.....	.....	.....	.....
Philadelphia	28.50–29.00	35.00–36.00	35.50	.....	41.00–42.00	37.00	.....
Pittsburgh	30.00–31.00	37.00–38.00	30.00–31.00	.....	42.00–43.00	.....	43.00–45.00
St. Louis*	26.50	38.00	29.00	40.00	.....	.....	43.00
San Francisco	20.00	43.00–46.00	36.00	39.00	43.00	.....	.....
Seattle	25.00	**34.00–35.00	23.00	.....	.....	.....	.....

* Brokers' buying prices. ** F.o.b. shipping point.

Why Do Foundries Use Over 200,000 Tons of *Lyquaface Sand Every Month?

You may profit by looking into the phenomenal growth of Lyquaface as a sand coating. Foundrymen welcome its superior qualities: Lyquaface is quickly and evenly distributed as a coating on the sand grains. Thus, it tends to increase permeability and produce castings of better quality and finish with *any* sand used. Since Lyquaface does not absorb moisture, lower moisture levels are afforded. Because it does not contain any light volatiles, Lyquaface generates far less gas. At the same time it is 3 to 4 times as effective by weight.

YOU MAY EXPECT THESE ADVANTAGES:

1. Improves quality of casting and finish.
2. Reduces casting weight.
3. Saves grinding, shot blasting, cleaning time.
4. Eliminates waste in handling.
5. Reduces losses.
6. Minimizes dust hazard.
7. Less parting is required.
8. Same grade of sand can be used for wide range of castings.
9. Increases flowability of metal.
10. Molds weigh less, improving production.
11. Gates and sprues can be remelted without cleaning.
12. Reduces need for gaggers, nails, and bars to a minimum.

*Trade Mark Reg.

Ask for Literature

Whitehead Brothers COMPANY

Established 1841

NEW YORK OFFICE
324 West 23rd St., New York 11, N. Y.

NEW ENGLAND OFFICE
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LYQUAGRIP
Ready-to-use core paste

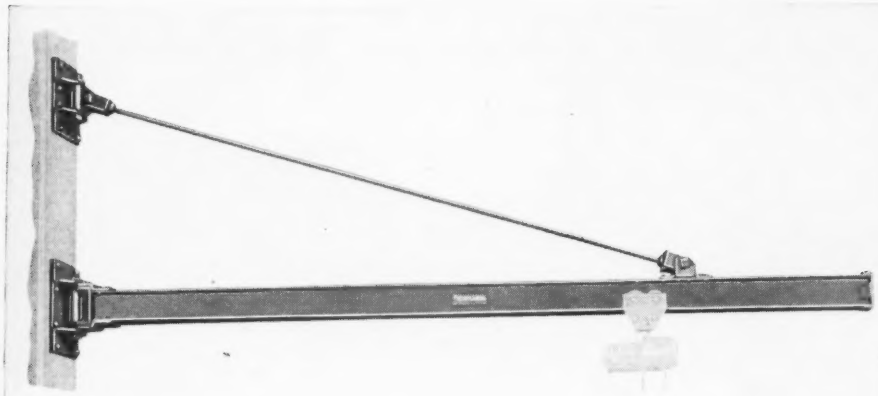
DOB-IT
Ready-to-use core mudding compound

JOINT-SEAL
Plastic compound for perfect sealing

LYQUAFLOUR
For cleaner surface, better shakeout

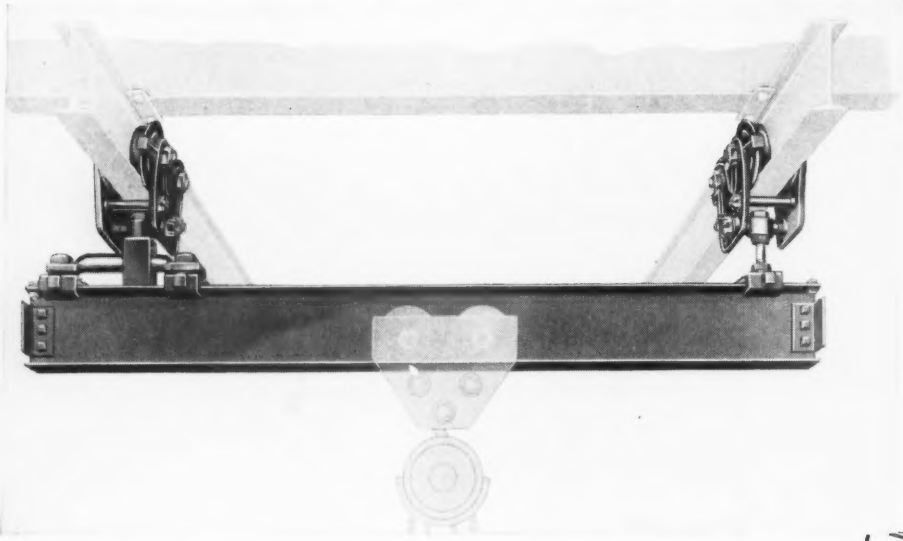
Small foundries choose

Richards-Wilcox Cranes



#939 Swinging Jib Crane

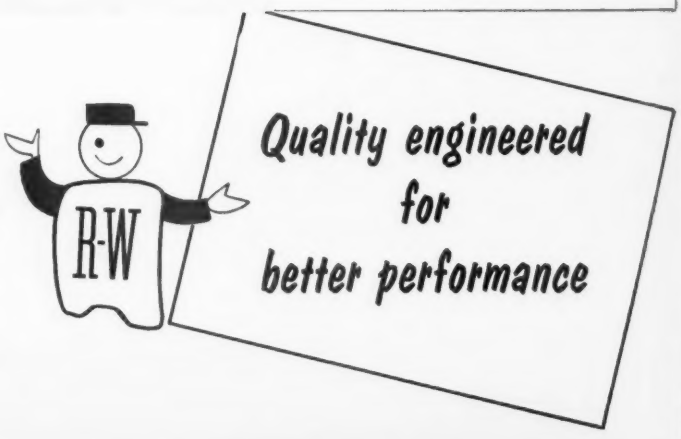
Simplicity of design makes this crane inexpensive and economical to install. Most commonly used with the rod support (above) but is also available with curved track for supporting outer end of boom. Available in a variety of sizes with capacities up to 4000 lbs.



#971 Flexible Traveling Crane

Simple in construction but extremely flexible in operation. Yoke and cross-head (shown at left end of crane bridge) are self-adjusting to variations in track width, permit economical installation because accurately straight I-beam runways are not required. Crane cannot bind because bridge need not maintain right angle to tracks. Not suitable as a transfer crane. Available in many sizes with capacities up to 8000 lbs.

You don't have to be BIG to be efficient! Richards-Wilcox Cranes, No. 939 and No. 971 are designed to give better, lower cost performance in small foundries. Simplicity of design makes them inexpensive, easy and economical to install, while maintaining the highest standards of quality. R-W Cranes are typical of the many *quality* products made by Richards-Wilcox to help bring greater efficiency and lower costs to small space production.



1880 RICHARDS WILCOX R-W AURORA TRADE MARK Reg. U. S. Pat. Off. 1954

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Meters by the millions ...

from metal melted by

6 DETROIT ROCKING ELECTRIC FURNACES

Recently, the 11,500,000th Neptune meter was produced. This, like the bronze-cased Neptune meters for 30 years, was made from metals melted in a Detroit Rocking Electric Furnace.

The six DEF Furnaces in Neptune Meter Company's foundry are under constant pressure to meet production demands which call for hundreds of tons of melt per month. To meet quality standards, melts must be uniform, of exact analysis, and produced with economy and speed.

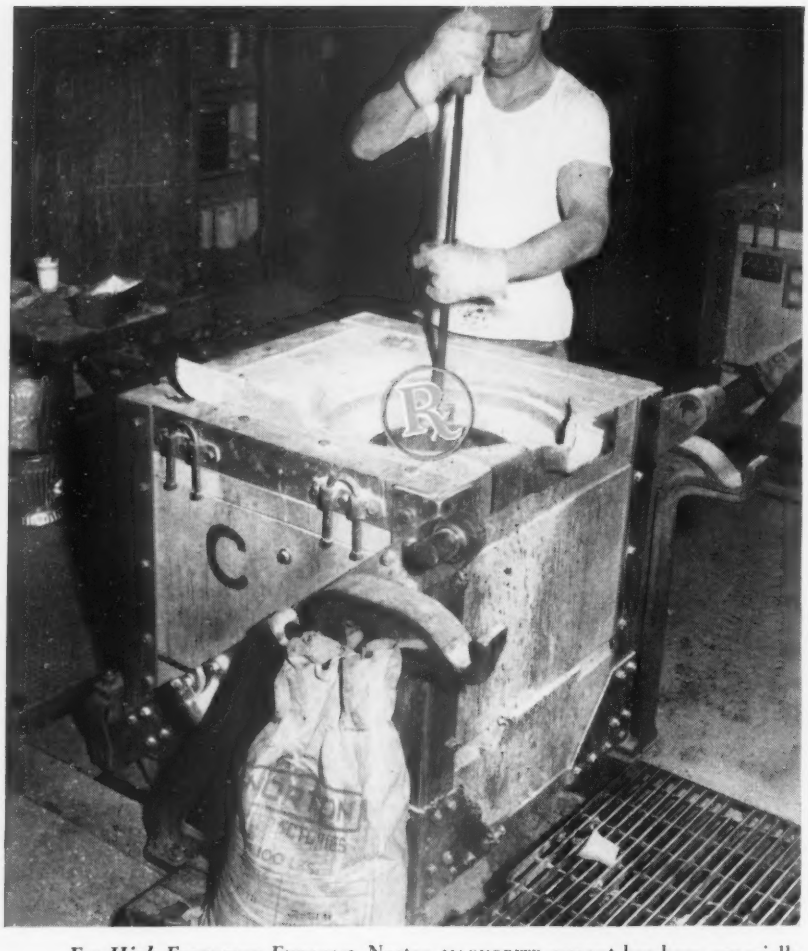
The indirect arc and controlled rocking action of Detroit Furnaces bring important advantages to production of both non-ferrous and ferrous melts. To learn how these advantages can benefit *your* foundry operations, let our engineers analyze your melting requirements. Write today!

DETROIT ELECTRIC FURNACE DIVISION

KUHLMAN ELECTRIC COMPANY • BAY CITY, MICH.

Foreign Representatives: in BRAZIL—Equipamentos Industrias, "Eisa" Ltd., Sao Paulo; CHILE, ARGENTINA, PERU and VENEZUELA: M. Castellvi Inc., 150 Broadway, New York 7, N.Y.; MEXICO: Cia Proveedora de Industrias, Atenas 32-13, Apartado 27A3, Mexico 6, D. F., Mexico; EUROPE, ENGLAND: Birlec, Ltd., Birmingham.

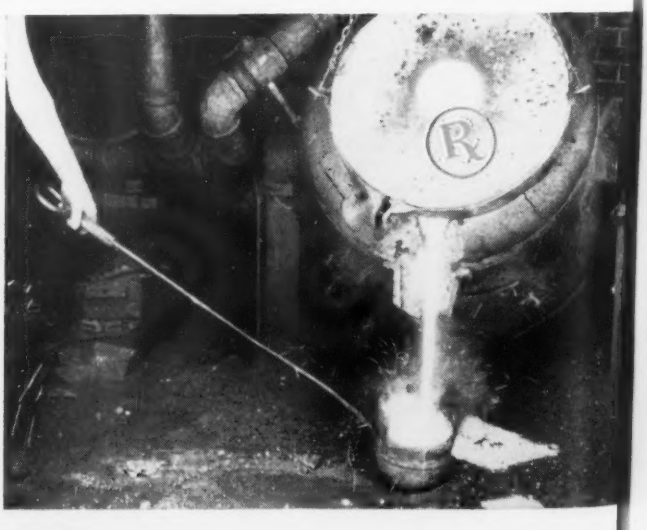
Rx for



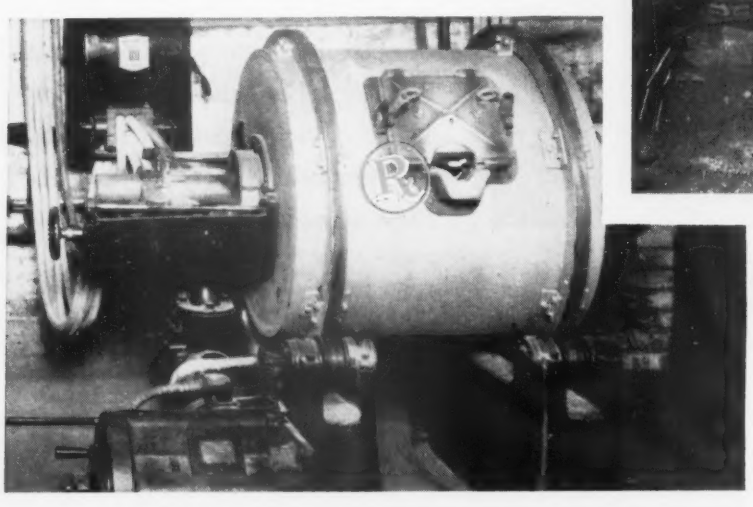
For High Frequency Furnaces. Norton MAGNORITE cement has been especially engineered for dry ramming and for withstanding temperatures up to 3250°F. Also, its slight expansion on maturing eliminates shrinkage cracks which might lead to furnace failure. It's the ideal prescription for lining high frequency induction furnaces handling melts of high temperature alloys.

Other Norton refractories for high frequency furnaces include FUSED STABILIZED ZIRCONIA crucibles for melting platinum and its alloys. They are not wetted by the metal, enabling you to recover 100% of the melt without destroying your crucibles, or to re-use the crucibles for different alloys without contamination.

For Low Frequency Furnaces. The furnace shown here has a special MAGNORITE cement lining. ALUNDUM cement is also widely used in low frequency induction furnaces. Whatever you're melting, including such refractory alloys as cupronickel and nickel silver, high copper alloys and Al, Te and Si bronzes, one of these two Norton Rx's is engineered to give you longer lining life — plus the high rammed density that resists metal penetration, erosion and chemical attack.



For Crucible Type Furnaces. The cover of this tilting crucible furnace and its cement lining are both made of CRYSTOLON refractory material, engineered for the user's particular needs. CRYSTOLON linings offer effective protection against flame erosion and thermal shock.



For Indirect Arc Furnaces. This installation owes much of its high production rate to its lining of correctly-engineered ALUNDUM cement. More and more foundries report excellent results with ALUNDUM and MAGNORITE crocks, covers and cements — engineered and prescribed for their individual metal processing needs. Norton prescriptions will save *you* time, trouble and money, too!

higher production . . .
better products . . . lower costs

Norton refractories are engineered for top performance—prescribed for many metal processing applications

Norton refractory products are *engineered* to give you the best possible Rx's — the most effective combinations of physical, chemical and thermal characteristics — for your particular refractory uses.

Norton ALUNDUM*, CRYSTOLON*, MAGNORITE* and FUSED STABILIZED ZIRCONIA refractory materials are made into shapes and cements to meet your requirements. For the Rx's *you* need to improve your processing — and for expert aid in any refractory problem — call in your Norton Refractories Engineer. And write for helpful literature to NORTON COMPANY, 309 New Bond Street, Worcester 6, Mass. *Canadian Representative:* A. P. Green Fire Brick Co., Ltd., Toronto, Canada.

NORTON

REFRACTORIES

Engineered . . . Rx . . . Prescribed

Making better products . . . to make other products better

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

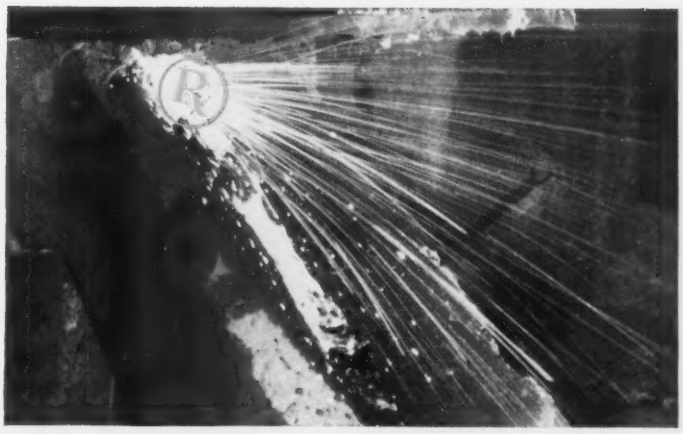
Other Norton Prescriptions

are helping metal processing plants to maintain schedules with minimum shut-downs. For example:

Heat-Treating And Sintering Furnaces operate at higher temperatures and lower costs, thanks to a wide variety of ALUNDUM and CRYSTOLON refractory products. Hearth plates, pier brick, burner blocks, muffles, muffle plates, skid rails, recuperator tubes, burner-tunnel and embedding cements combine high refractoriness with excellent thermal conductivity and resistance to spalling, erosion and corrosion.

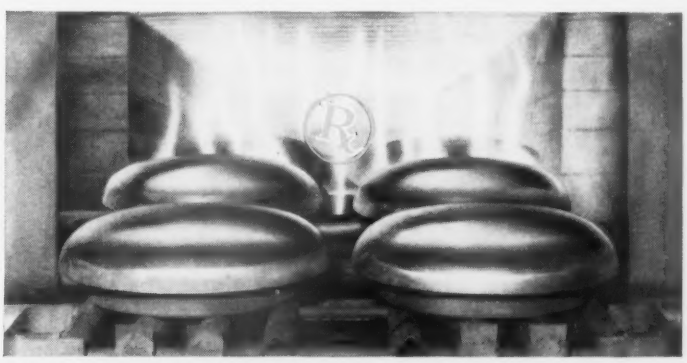
Desulphurizing Ladles which require addition of sodium carbonate gain consistently longer lining-life when ALUNDUM cement is used. One gray iron foundry, using a 1500-lb. U-type ladle reports that ALUNDUM cement lasts two to four times longer than other linings, month in and month out.

Steel Ladles show equally successful results when lined with ALUNDUM cement. One plant, using it in a 1000-lb. teapot ladle to handle stainless steel, stepped up the number of heats from 47 to 103.



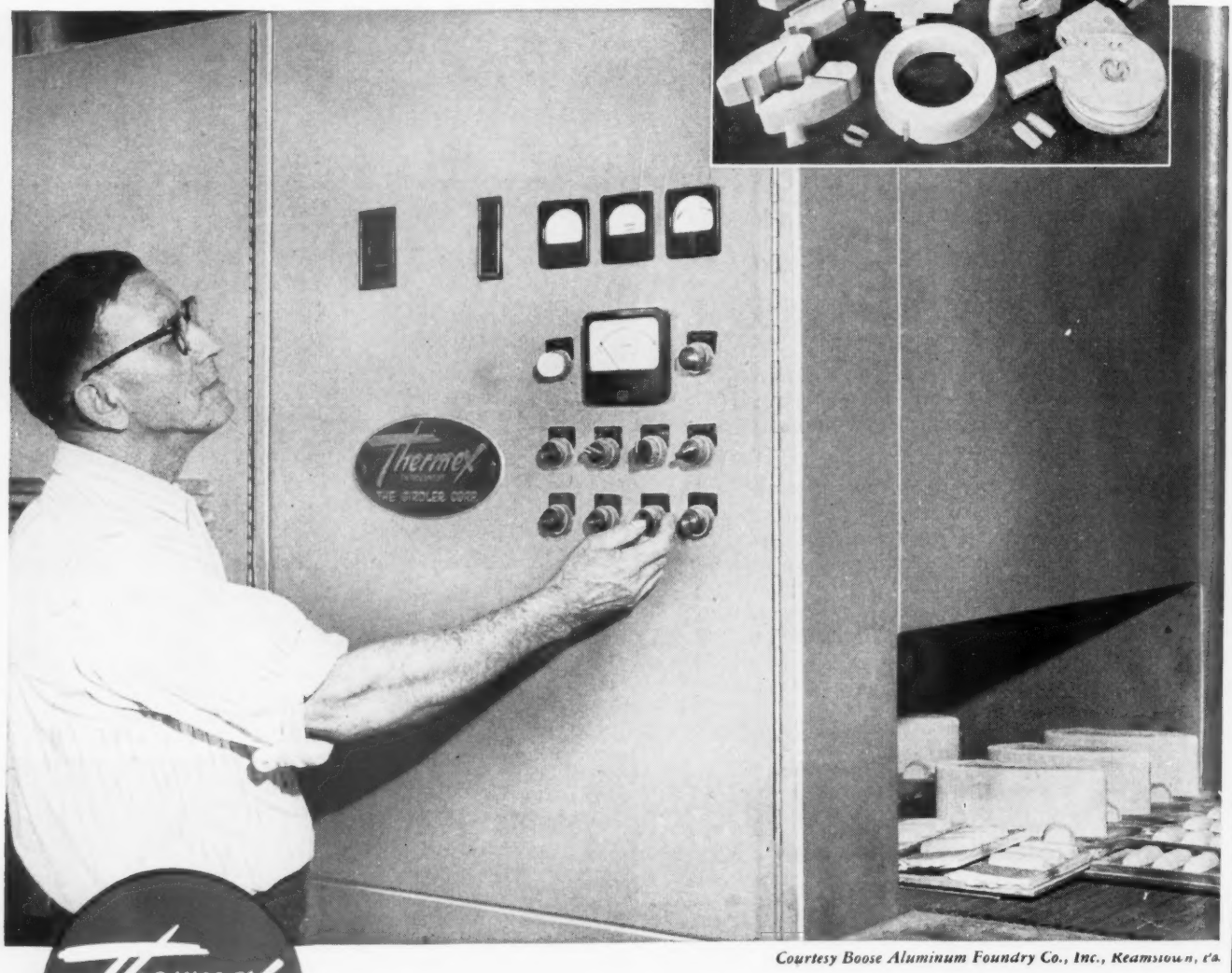
For Cupola Type Furnaces. For back slagging cupolas, the Norton Rx is CRYSTOLON slag hole blocks, as shown. For capping the notch and lining the slag chute in front slagging cupolas, CRYSTOLON bricks and cement are prescribed. This refractory material is engineered to give exceptionally long service life at temperatures up to 3050°F. It has great resistance to slag penetration and chemical attacks—and 5 to 15 times the resistance of ordinary fire clay to erosion and corrosion.

For Reverberatory Furnaces. The Rx for this reverberatory furnace is Norton CRYSTOLON refractory cement, engineered for maximum service life of this particular metal-melting job.



For Electric Furnaces. Furnace equipment of this type operates at lowest performance and maintenance costs when CRYSTOLON heating elements — Norton "Hot Rods" — are installed. They're the newest Norton Rx, engineered and prescribed for electric furnaces. They can be used to replace your present rods — and have proved their ability to deliver two to four times longer service life. Ask for our special booklet on CRYSTOLON "Hot Rods" for all applications.

33% MORE OUTPUT per core room manhour due to continuous baking with THERMEX Core Baking Equipment is the report from this aluminum foundry. Inset shows typical cores. Any or all can be baked at the same time... all uniformly regardless of size or shape.



Courtesy Boose Aluminum Foundry Co., Inc., Reamstown, Pa.

Thermex®
ELECTRONIC CORE-BAKING EQUIPMENT

How you reduce core rejects with this uniform baking

EVERY GRAIN OF SAND in the core gets the *proper amount of heat* with THERMEX* Core Baking Equipment. This uniform, rapid heat *avoids over-baking* of surfaces and thin sections and reduces dimensional changes. Castings are *more accurate* and have *smoother surfaces.*

Find out how you can improve your product, increase output per manhour, save core storage space, have a cleaner shop, and cut costs with THERMEX Core Baking Apparatus. Write for booklet. The Girdler Company, Thermex Division, Louisville 1, Kentucky.

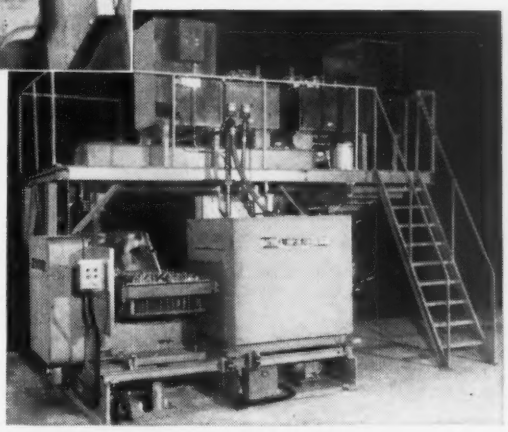
*THERMEX Trade-mark Reg. U. S. Pat. Off.

the **GIRDLER** Company

A DIVISION OF NATIONAL CYLINDER GAS COMPANY

THERMEX DIVISION

Capable of producing forty 22 x 28 inch shells per hour, this unusual new single-station machine developed by Mechanical Handling Systems, Inc., of Detroit, incorporates a universal holder and stripper to fit any pattern. A cam lock release for ejector pins eliminates holder springs. An automatic mixer and gravity feed keeps the sand-resin mix level in the hopper, and curing oven rolls into position to surround the entire pattern for even curing.



For low cost, accurate shell molding, specify . . .

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Assures Fast, Positive Release • Keeps Patterns Cleaner Nonflammable and Noncorrosive • Dilutible in Hard or Soft Water • Resists Creaming or Separating • Whether you're using manual equipment or automatic machines, you'll save money with Dow Corning 8 Emulsion. Especially designed for the shell process, this silicone parting agent can't break down to form a carbonaceous deposit on patterns. Cleaning costs are minimized, and you increase production of shells with consistently high dimensional accuracy. For more information and a free trial sample, fill in and mail the coupon today.

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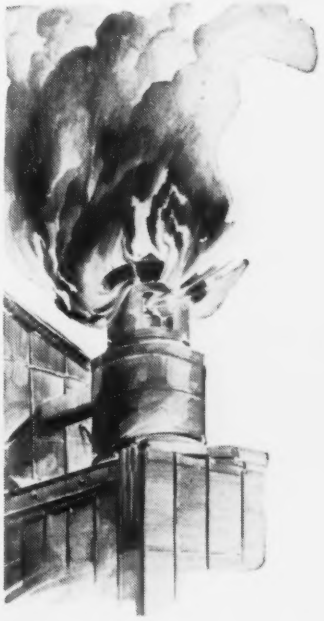
Canada: Dow Corning Silicones Ltd., Toronto; **England:** Midland Silicones Ltd., London; **France:** St. Gobain, Paris

Silicone Insulation Saves $4500 in Rewind Costs; Outlasts Class A 36 to 1 In Core Oven Fan Motor



When the Lakey Foundry & Machine Co. installed an exhaust fan inside the top of their core oven stack, a resinous deposit quickly built up on the blades. Overloaded and unbalanced, the 7½ hp drive motor failed every 3 or 4 weeks. Almost inaccessible, it cost more to get it out of the stack than it did to rewind.

Then, three years ago the motor was rewound with Class H insulation made with Dow Corning silicones. New bearings lubricated with Dow Corning 44 Silicone grease were installed, and the motor was hoisted back into the stack. It has been operating steadily ever since with savings in rewind costs alone amounting to over $4500.

That kind of performance in installations all over the country proves that silicone (Class H) insulation has over 10 times the life of the next best class of insulating materials. It can also be used to increase the output of most motors by as much as 50%.

DOW CORNING SILICONES

Send this coupon TODAY

DOW CORNING CORP.
Dept. AH-22
Midland, Michigan

Gentlemen: Please send me

- ☐ Free sample of Dow Corning 8 Emulsion
- ☐ Performance data on Class H insulation
- ☐ List of Class H rewind shops
- ☐ List of Motor Manufacturers

Name _____

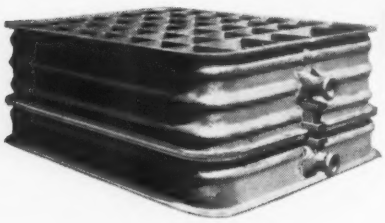
Company _____

Address _____

_____

YOU CAN IMPROVE FOUNDRY EFFICIENCY AND ECONOMY

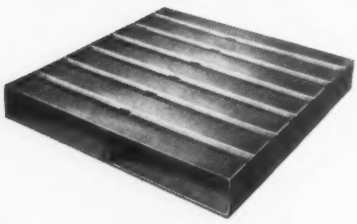
at these 4 stages of production



CH-40
Crane Handling Flask

MOLDING WITH REPUBLIC STEEL FOUNDRY FLASKS

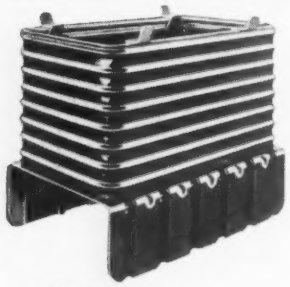
speeds efficiency through ease of operation and ease of handling. You enjoy real economy through long, trouble-free service. Republic Flasks are designed and built to meet the needs of the individual job.



P-14
Doubleface Pallet

MOVING WITH REPUBLIC STEEL PALLETS

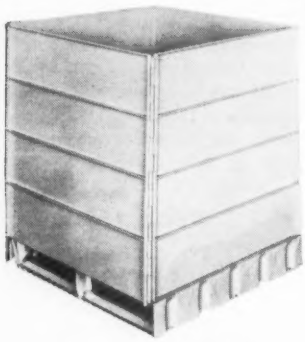
keeps production lines running smoothly. Materials are available when and where you need them. Republic Steel Pallets are designed to eliminate maintenance expense. They can be depended upon to give years of service at minimum cost.



PB-120T
Box and Skid with Tiering Lugs

STORING WITH REPUBLIC STEEL BOXES AND SKIDS

conserves valuable space. In addition, Republic Boxes and Skids are used to keep materials on the move from receiving to shipping. They are made in a wide range of sizes to meet your individual requirements.



COLLAPS-A-TAINER

SHIPPING WITH REPUBLIC STEEL COLLAPS-A-TAINERS

cuts your handling costs. The Collaps-a-tainer can be loaded at the end of the production run, and shipped as is. To return, it is quickly and easily knocked down. Four collapsed units ship in the space of one open. Standard size is 30" x 30" x 30". It can be stacked to any practical height.

For more information on the complete line of Republic Materials Handling Equipment, write for our new catalog No. 620.

REPUBLIC STEEL CORPORATION
Pressed Steel Division
6208 Truscon Avenue, Cleveland 27, Ohio
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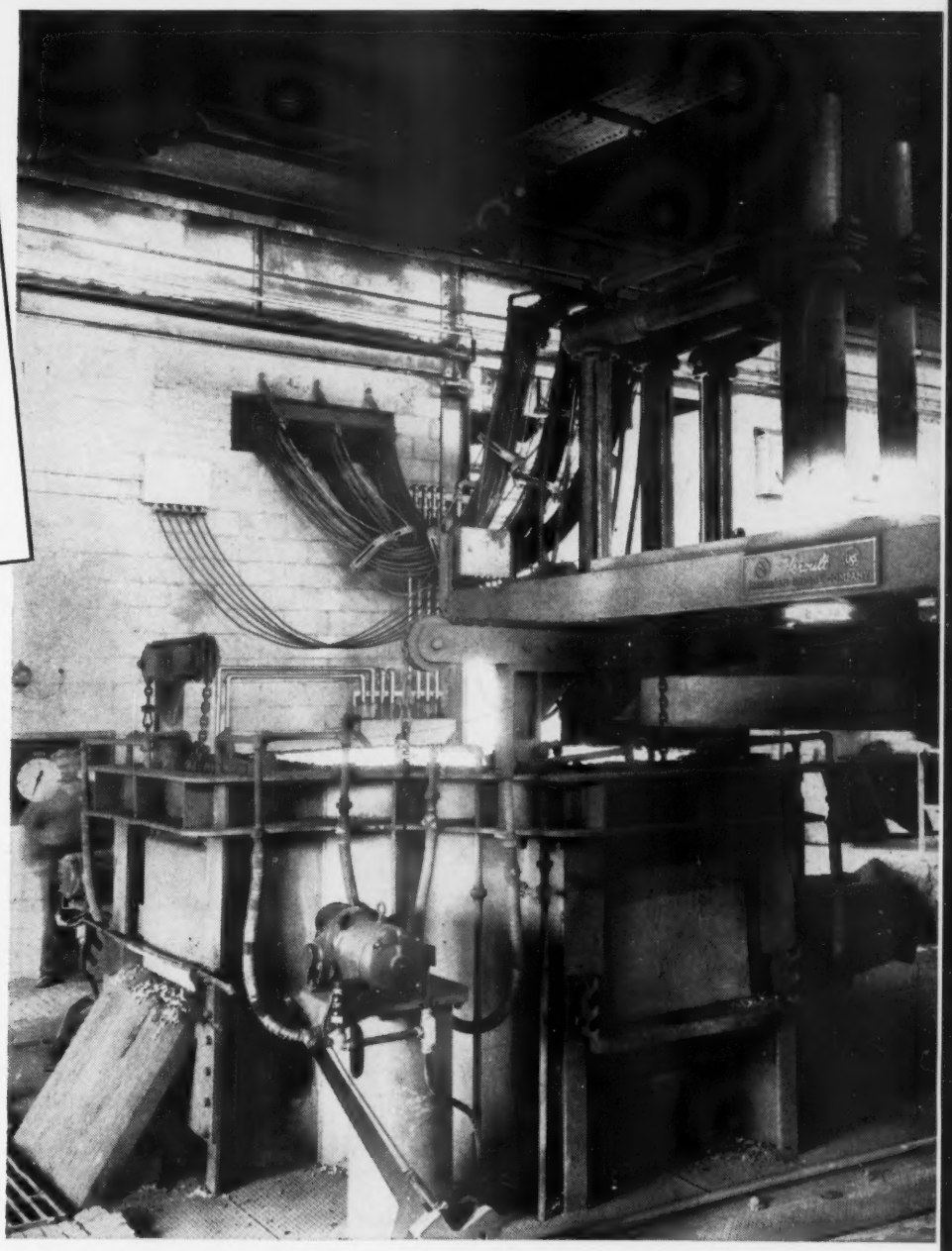
Export Department: Chrysler Building, New York 17, N. Y.

REPUBLIC STEEL

REPUBLIC
MATERIALS HANDLING EQUIPMENT

Heroult
ELECTRIC MELTING FURNACES



The high production capacity of the Heroult makes it the foundryman's favorite furnace!

NEW CATALOGUE
Now Ready

Contains up-to-date information on Heroult Electric Melting Furnaces — types, sizes, capacities, ratings, etc. For free copy, write to our Pittsburgh office.

AVAILABLE in foundry sizes with either Gantry or swing-type roof, these widely used furnaces are equipped with the latest time- and labor-saving mechanical devices and electrical controls. They are noted for their efficient performance, low operating and maintenance costs.

We welcome an opportunity to help you select and install the foundry furnace best suited to your requirements.

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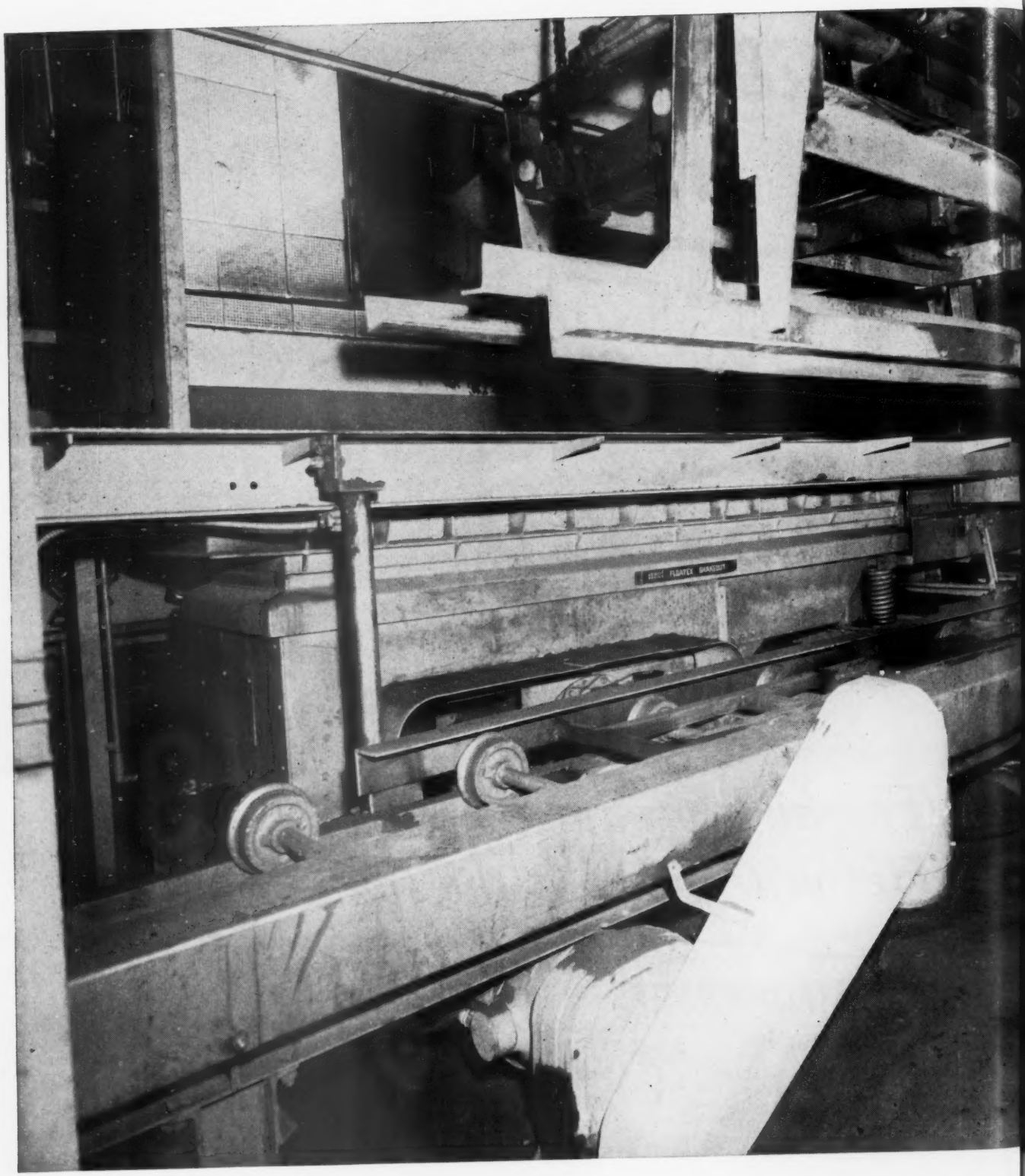
USS

UNITED STATES STEEL

Mechanization Pays Off a



HEWITT-ROBINS

EXECUTIVE OFFICES, STAMFORD, CONNECTICU

f at American Brake Shoe

EQUIPMENT: One Hewitt-Robins triple-deck 4' x 12' Floatex Shakeout and double-deck 30" x 85' 0" Vibrating Conveyor—Two Belt and Bucket Elevators —Three 20" and five 24" Hewitt-Robins Belt Conveyors.

LOCATION: Pomona Foundry of the Brake Shoe & Castings Division, American Brake Shoe Company, Pomona, California.

PERFORMANCE: Hewitt-Robins Floatex Shakeout with special triple deck construction simultaneously handles 10 flasks, rapidly cleans castings and separates sand. Castings are fed to top deck of vibrating conveyor, sprued and sorted. Chill blocks are also reclaimed while sprues discharge over end of top deck to tote boxes for salvage. Vibrating conveyor handles sand on lower deck to fine screen and lump-breaker for reduction and cleaning. Belt conveyors and Belt and Bucket elevators provide continuous flow of material for the sand system.

RESULTS: Only three men required to shakeout, sprue and sort 5200 castings per 8 hour shift . . . shakeout production per man hour greatly increased.

ENGINEERING DATA

Floatex® Shakeouts: Single units with decks from 2' x 2' to 8' x 10'. Multiple unit arrangements up to 16' x 33' and capacities to 300,000 lbs.

Vibrating Conveyors: 8" to 48" wide, up to 150' length with one drive. Capacity to 200 TPH of 100 lbs. cu. ft. material at horizontal setting. Carries hot-cold, dry-moist, fine-large, loose or packaged materials.

Belt Conveyor Systems: Engineered and Sectional . . . Engineered: designed to suit, level or high lifts, light or heavy duty, all components matched to service, widths 14" to 72". Sectionals: standard units from stock complete with all components, 24" and 42" deep trusses, widths 18" to 36", motors to 30 HP.

Belt and Bucket Elevators: Standard centrifugal widths 6" to 18", standard continuous widths 9" to 26".

Here is a partial list of

HEWITT-ROBINS PRODUCTS

that will help you cut handling costs and increase operating efficiency.

MACHINERY

Belt Conveyors
Belt & Bucket Elevators
Car Shakeouts
Conveyor Idlers
Dewaterizers
Mechanical Feeders
Foundry Shakeouts
Mine Conveyors
Reclaiming Systems
Screen Cloth
Stackers & Trippers
Vibrating Conveyors & Screens

INDUSTRIAL RUBBER PRODUCTS

BELTING:

Conveyor
Elevator
Transmission

HOSE:

Acid
Air & Air Drill
Barge Loading
Dust Suction
Fire
Fuel Oil & Gasoline
Gasoline Pump
Mud Pump Suction
Oil Suction & Discharge
Propane-Butane
Road Builders'
Rotary Drilling
Sand Blast
Sand Suction
Sea Loading
Servall®, All-Service
Steam
Tank Car & Tank Truck
Vacuum & Air Brake
Water & Water Suction
Welding, Twin-Weld®

•

For information and service on industrial rubber products, contact your Hewitt-Robins Industrial Supply Distributor. Through his complete stock of Hewitt-Robins Rubber products, and his familiarity with local field conditions, he can fill your supply needs promptly and correctly. See Classified Phone Book for the Hewitt-Robins Industrial Supply Distributor serving your area.

1853

INCORPORATED

DOMESTIC DIVISIONS: Hewitt Rubber • Robins Conveyors • Robins Engineers • Restfoam
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THERE IS A SOLUTION
TO YOUR NONFERROUS
Foundry Problems...

Mold Reaction

When you call upon
LAVIN'S ENGINEERING SERVICE

Mold reaction resulting from improperly conditioned sand is the cause of many defective castings.

Low flowability of sand may cause a ram-off, which will result in a shift. Excessive moisture in sand may cause boiling of the metal against the mold surface and where steam bubbles fail to find their way through the surface of the casting, before the metal solidifies, defects such as shown are the result.

Weak sand, that is, sand with insufficient bond or with improperly distributed bond material causes sand wash and cutting, leaving rough lumps at some points on the casting and angular holes at other points. These are but a few of the problems caused by poor sand practice.

Lavin's metallurgical staff is always ready to assist the foundryman in finding the solution of any routine or special casting problem. Our chemical and research laboratories are available to you at no cost or obligation.

Next time call upon LAVIN'S engineering service
"The Foundryman's Problems Are Our Problems"

FREE: Write for your copy of the 20-page Lavingot technical Journal Vol. 10. No. 1 & 2 Containing, Specifications . . . test bar designs Nonferrous Ingot & Casting Alloys in chart form.

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R. LAVIN & SONS, INC. 1900 — 54 Years — 1954 — SERVING THE FOUNDRY INDUSTRY

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Clark's HYDRATORK DRIVE CARLOADER

The revolutionary HYDRATORK DRIVE lift truck is now available in Clark's 3000-5000 lb. Carloader. The new clutchless, torque converter transmission has already won many friends among users of Clark's 6000-7000 lb. Utilitrucs. The basic benefits of this Clark-built transmission are:

1. **Lower cost:** no gear clash, no clutch problems, excellent serviceability.
2. **More power:** faster, smoother get-away, better gradability.
3. **Less driver fatigue:** finger-tip direction control, no clutching or shifting.

Send for FREE Booklet

The free booklet shows detailed disassembled views of the HYDRATORK DRIVE, explains how it works. Clip the coupon to your company letterhead and we'll send it to you.

CLARK EQUIPMENT

Industrial Truck Division
CLARK EQUIPMENT COMPANY
Battle Creek 16, Michigan

☐ Send HYDRATORK DRIVE booklet

Name _____

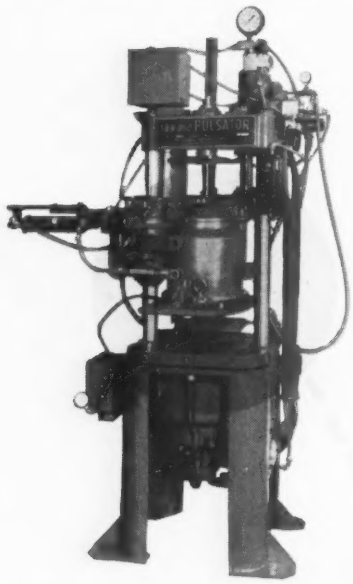
Firm _____

Address _____

City _____ Zone _____ State _____

New Universal *Quick Change* Blow Plate...

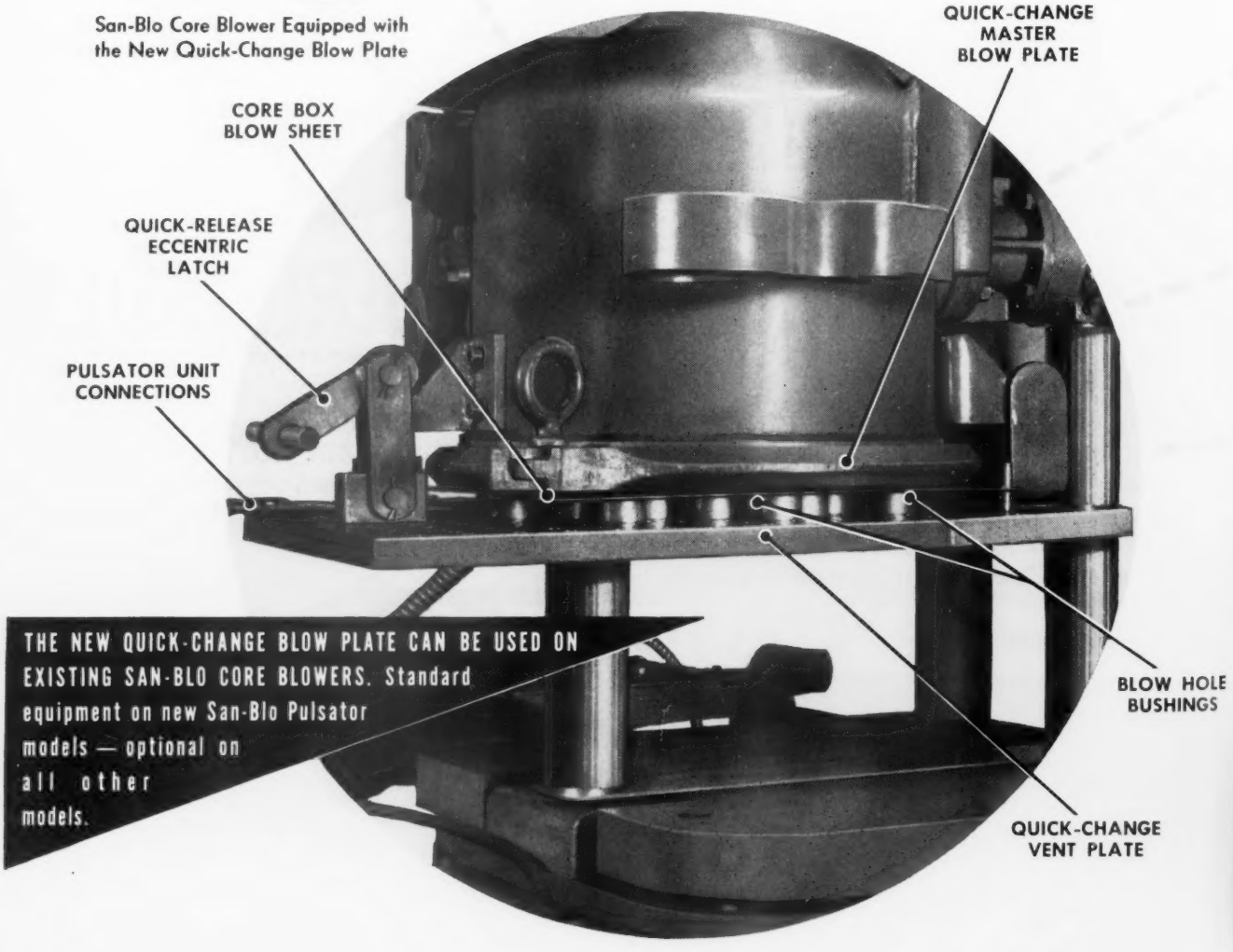
REDUCES CORE BOX RIGGING AND CHANGEOVER TIME TO A FEW MINUTES



San-Blo Core Blower Equipped with the New Quick-Change Blow Plate

Low quantity production of identical cores can now be blown on an efficient and economical basis with San-Blo and the New Universal Quick-Change Blow Plate.

- One Master Blow Plate blows all cores within machine capacity.
- Low cost Blow Sheets replace expensive blow plates required for each different type core.
- Less than 5 minutes required to make up a Blow Sheet and rig a core box for blowing different type cores. And, once a Blow Sheet is made and identified with its related core box, changeover time is slashed to a matter of seconds.



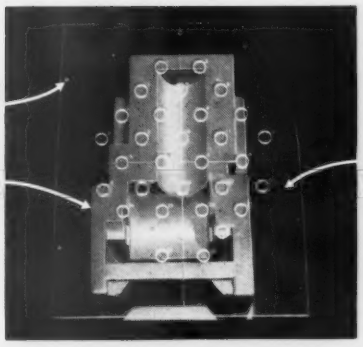
THE NEW QUICK-CHANGE BLOW PLATE CAN BE USED ON EXISTING SAN-BLO CORE BLOWERS. Standard equipment on new San-Blo Pulsator models — optional on all other models.

...for SAN-BLO Core Blowers

It's easy to make and use the *Quick Change* blow sheet...

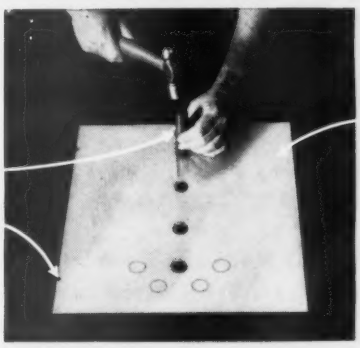
STEP 1 DETERMINE BLOW HOLE ARRANGEMENT.

Mark center lines on top surface of core box. Place Gauge Plate on core box aligning center lines of core box and Gauge Plate. Note stamped numbers identifying desired blow hole locations in Gauge Plate.



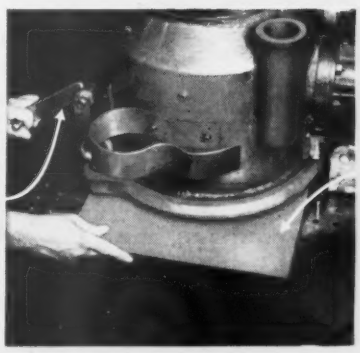
STEP 2 PUNCH BLOW SHEET

Place Gauge Plate on Blow Sheet, aligning Gauge Plate locating holes with notches in Blow Sheet, then mark blow hole locations noted in Step 1. Remove Gauge Plate and punch out blow holes in Blow Sheet.



STEP 3 INSERT BLOW SHEET

Unfasten eccentric latch and insert Blow Sheet between Master Blow Plate and Vent Plate. Secure latch and San-Blo is ready to blow the core.



For information on San-Blo and the New Quick-Change Blow Plate, write to the home office.

FEDERAL

MEMBER FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. FEMA

The FEDERAL FOUNDRY SUPPLY Company

4600 EAST 71st STREET, CLEVELAND 5, OHIO

CHATTANOOGA · CHICAGO · DETROIT · LOS ANGELES · MILWAUKEE · NEW YORK

EUROPEAN REPRESENTATIVE: SA. PH. BONVILLAIN & E. RONCERAY Rue Paul-Carle a Choisy-Le-Roi, Seine, France

One-ton dust pan

FLORIDA Machine and Foundry Company makes its "PAYLOADER" tractor-shovel pay dividends on many material-handling jobs. One of the most interesting is the removal of rotor blast dust from the collecting hopper. The "PAYLOADER" drives under the hopper, the gate is opened and a ton of dust flows quickly into the "PAYLOADER" bucket through a canvas boot — without muss or dust-raising, as you can see.

This foundry, like hundreds of others, uses its "PAYLOADER" for many sand-handling jobs — scooping, carrying, spreading, and to do all sorts of lifting, loading and hauling jobs both inside and outside. Multiple speeds in reverse, as well as forward — plus short-turning ability — enable them to handle easily and work fast in close, awkward places.

It will pay you to find out how modern "PAYLOADERS" can improve your output and simplify your material-handling problems. The Frank G. Hough Co., 703 Sunnyside Ave., Libertyville, Illinois.

Bentonite and other bagged materials are quickly carried from boxcar and stacked. Hydraulic power gives precise bucket control.

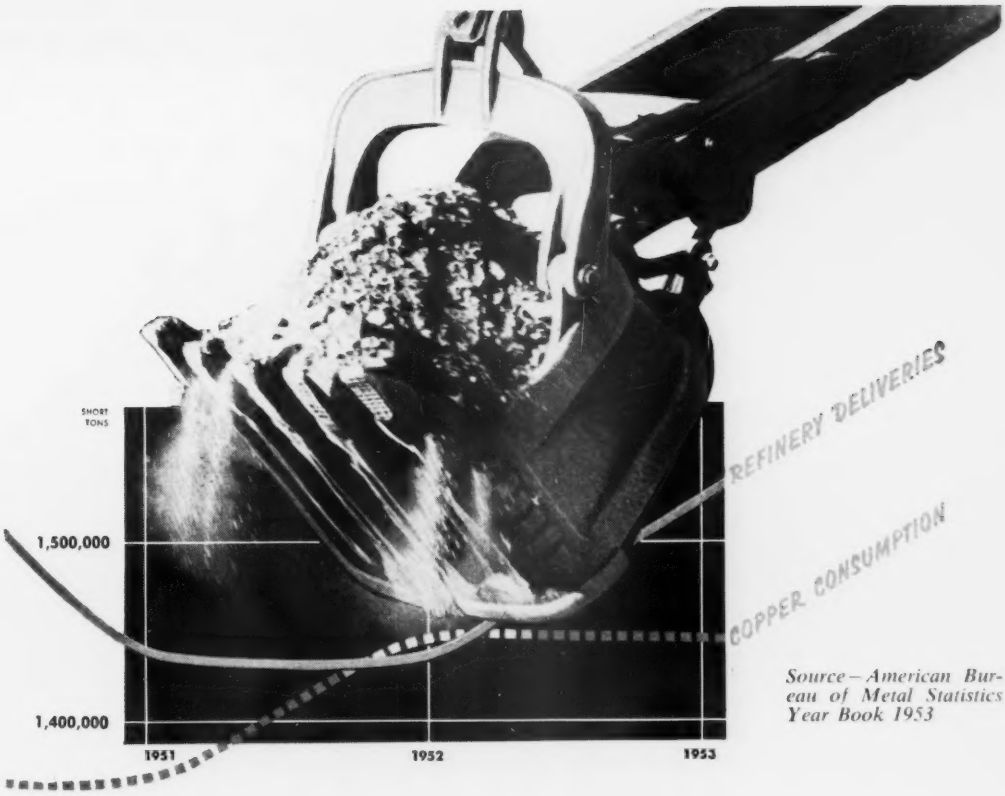
JOB STUDIES are available, illustrating and describing operations in several different plants. These helpful, authorized studies can be secured on request, without obligation.

YOU CAN'T COMPETE IF YOUR EQUIPMENT IS OBSOLETE

SAY "HUFF"

PAYLOADER®

THE FRANK G. HOUGH CO. • Since 1920



Source – American Bureau of Metal Statistics Year Book 1953

Plenty of Copper... today and tomorrow

The assurance that copper is in abundant supply and *can be used without restrictions* is the "go ahead" for industry. You can now rate PERFORMANCE over AVAILABILITY when choosing materials. By using copper and its alloys, brass and bronze, your product is easier to fabricate, better and more durable.

We can get more copper than we now have. Although industry and government have been consuming more copper than in any previous peacetime period, production has kept pace with this increased demand. And producers are not working at full capacity!

More copper keeps on coming. Eleven major new projects in the U. S. will start producing in the next 3 years. These mines will add 250,000 tons to our annual production – more than *¼ of all the domestic copper mined during 1953*. In addition, recent improvements in mining techniques now make it possible to obtain copper from ores considered commercially unworkable in the past.

Copper is virtually indestructible. At least 3 out of every 4 pounds of copper used in today's products, when scrapped, can be re-used in the future. Every day we are adding to our "copper capital". The more copper we use . . . the more we have!

Copper has a new ability to serve you. Many of your problems are being solved in the laboratories of the copper and brass industry. Whether it's a new alloy, a different temper or a special property . . . copper can help you develop new ideas. Copper can bring old methods up to date. Call a supplier of copper and brass and convert your thoughts to action!

❊ ***"Copper . . . is fortunately available in ample supply to meet any foreseeable demand"***
Foreword, U. S. Dept. of Commerce
B.D.S.A. Copper Quarterly, August 1954

For information about U. S. copper supplies including free copies of this Government report and the new booklet, "Copper . . . Today and Tomorrow", send attached coupon to:

Copper & Brass Research Assn., Dpt. QQ
120 Lexington Ave., New York 17, N. Y.

NAME .....
COMPANY .....
ADDRESS .....
CITY ..... STATE .....

COPPER & BRASS Research Association

Copper or its alloys provide these advantages . . .

Best conductor of electricity commercially available.

Does not rust . . . high corrosion resistance.

Best heat transfer agent of all commercial metals.

Easy to machine, form, draw, stamp, polish, plate, etc.

Welds readily . . . excellent for soldering and brazing.

3 Great Wheels for Non-Ferrous Grinding

Norton ALUNDUM* resinoid, CRYSTOLON* vitrified and BN wheels cover a wide range of soft-metal applications . . . adding the profit-boosting

"TOUCH of GOLD"

A Norton ALUNDUM Resinoid Wheel, rough grinding aluminum castings, has the fast cutting action and long wheel life that add up to the ideal grinding quality for applications on this metal.

The most reliable way you can gauge any grinding wheel's value is by its *grinding quality* — the factor which takes into consideration *both* wheel cost and labor cost.

Continuous research and testing by Norton, together with many job-reports from non-ferrous foundries, prove that for three important types of soft-metal grinding there are three types of Norton wheels with exactly the right grinding quality to provide best performance at lowest cost. As follows:

For Grinding Aluminum, Norton ALUNDUM resinoid wheels offer the abrasive-and-bond combination that means fastest, coolest cutting action plus longest wheel life.

For Grinding Bronze and Brass, Norton CRYSTOLON vitrified wheels wear at just the right rate to assure the grinding quality that means more grinding for less money.

For Cutting-Off and Notching gates and risers, Norton BN reinforced resinoid wheels combine unusually high resistance to breakage with fast cutting action and long wheel life.

Your Norton Distributor

will be glad to help you select wheels that will add the cost-cutting, product-improving "Touch of Gold" to every grinding job, on every material and every type of machine. And remember: only Norton offers you such long experience in both grinding wheels and machines to help you produce more at lower cost. Write for booklet "Rough Grinding" to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your classified phone directory. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts.

Making better products. . . to make other products better

A Norton CRYSTOLON Vitrified Wheel combines the abrasive and bond that make grinding this bronze worm-gear casting an easier, more economical job. There's no better wheel for grinding brass and bronze on any type of machine.

A Norton BN Reinforced Resinoid Wheel is not only useful for cutting-off and notching gates and risers but for light snagging and many other jobs. It's one of industry's safest, longest-lasting cut-off wheels.

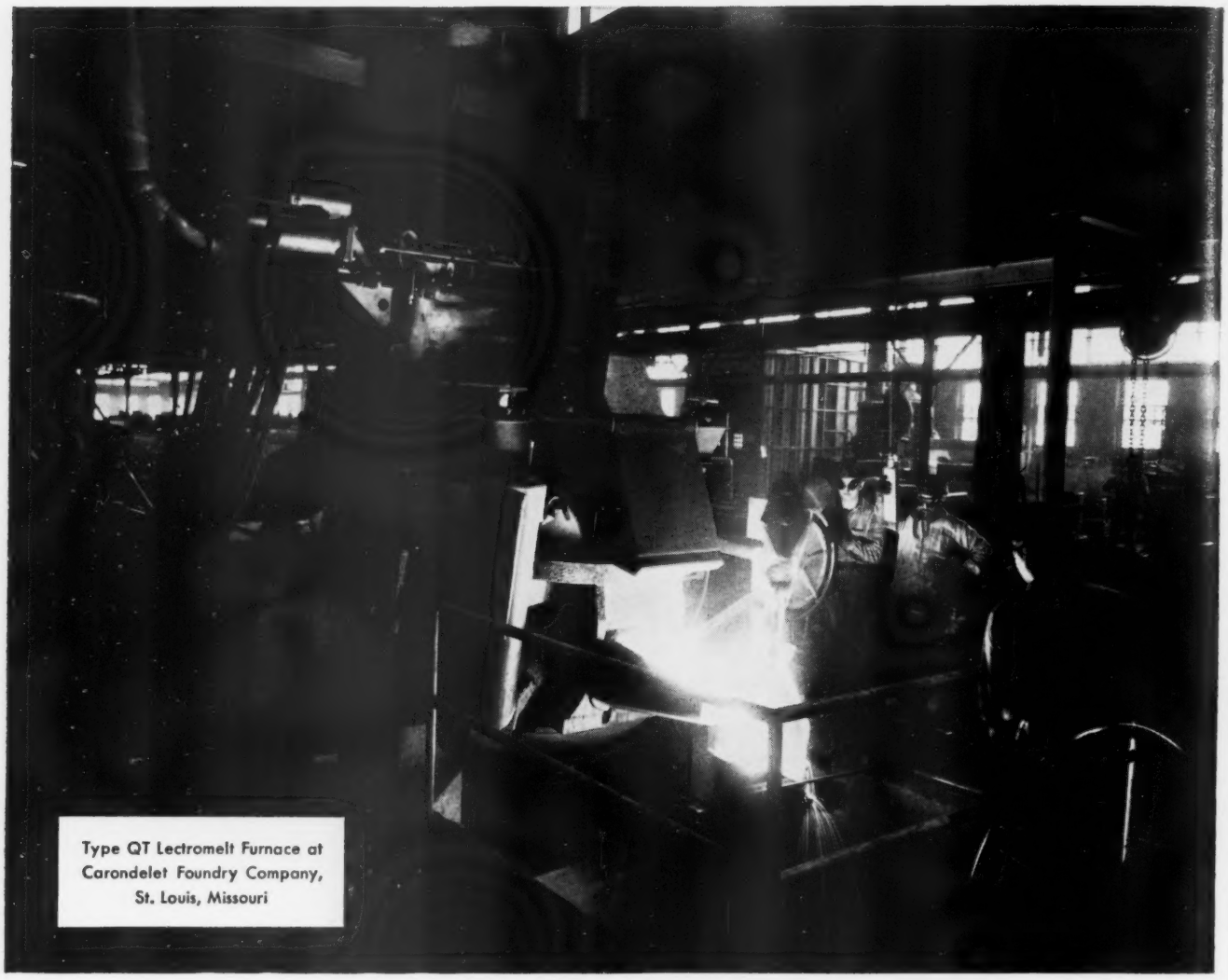
NORTON

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

W-1591

and its BEHR-MANNING division

NORTON Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes



Type QT Lectromelt Furnace at Carondelet Foundry Company, St. Louis, Missouri

"Our *Lectromelt** Furnace gives us the Versatility needed in our jobbing foundry"

"Top-charging doesn't give our Lectromelt Furnace much time to loaf, boosting its productive time and holding down labor costs," reports Carondelet Foundry Company.

"Its versatility lets us shift easily from one type product to another . . . from high strength gray irons for pressure castings, to special steels for heat resistance, corrosion and abrasion resistance. In 10 minutes we make a spectrographic, prepouring analysis, permitting us to adjust each heat to meet specifications.

"Our Lectromelt Furnace is new, but already it's proved its worth."

If your business involves melting, smelting, refining or reduction, it will pay you to investigate what Lectromelt Furnace Equipment will do for you. For Catalog No. 8, write: Pittsburgh Lectromelt Furnace Corporation, 314 32nd Street, Pittsburgh 30, Pa.

Manufactured in . . . CANADA: Lectromelt Furnaces of Canada, Ltd., Toronto 2 . . . ENGLAND: Birlec, Ltd., Birmingham . . . FRANCE: Stein et Roubaix, Paris . . . BELGIUM: S. A. Belge Stein et Roubaix, Bressoux-Liege . . . SPAIN: General Electrica Espanola, Bilbao . . . ITALY: Forni Stein, Genoa. JAPAN: Daido Steel Co., Ltd., Nagoya

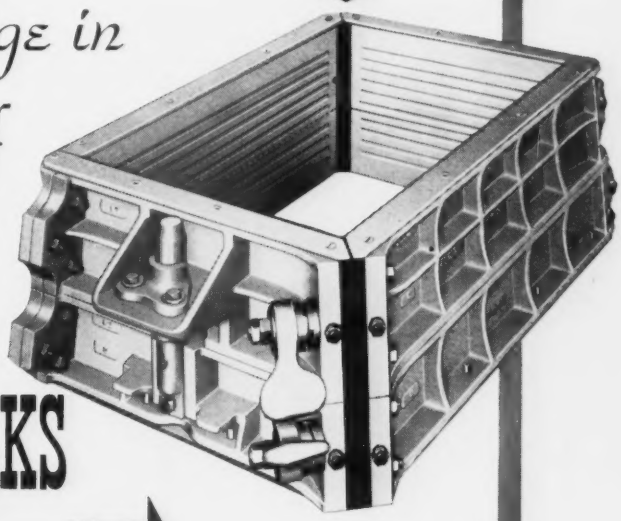
MOORE RAPID

WHEN YOU MELT... *Lectromelt*

*REG. T. M. U. S. PAT. OFF.

No Sand Can Lodge in Open Corners of

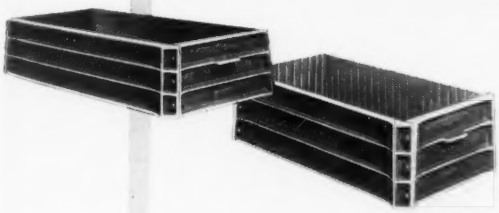
FREMONT SPREADLOCK FLASKS



—the corner gaps are completely closed by long-life, easily replaceable, live rubber corner inserts.

That's just one of the many reasons for the popularity of this new flask. Made of magnesium, which has twice the tensile strength of aluminum, they afford much longer service. Furthermore, magnesium weighs ⅓ less than aluminum, so they are easier to handle.

But more importantly, the accurately machined inside surfaces and flanges, and steel-faced top and bottom flanges assure more exacting work.



Start Saving Money with **FREMONT CAST IRON OR CAST ALUMINUM JACKETS**

New sides or ends may be easily inserted because of the precision machined and drilled, bolted corner construction. It is no longer necessary to scrap entire jackets. The standard style is designed for ordinary foundry practice, while the grooved style, which permits ready gas escape, is ideal for steel foundries. Flasks and jackets can be assembled on 3°, 4° or 5° taper.

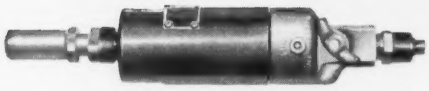
THE FREMONT FLASK CO.
Fremont, Ohio

Write today for free literature and prices on Fremont Spreadlock Flasks, Fremont Standard Slip Flasks (with the GROOV-LOCK FOOLPROOF PIN,) and Fremont Cast Iron or Cast Aluminum Jackets. All orders given prompt attention.

Here is a new line of

CLECO HEAVY DUTY 2 INCH AND 3 INCH GRINDERS

No. 14 Series

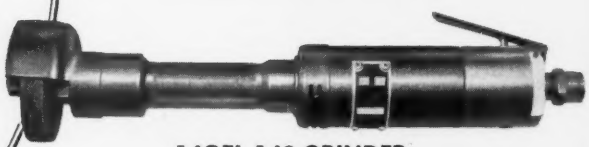


14G-90 GRINDER

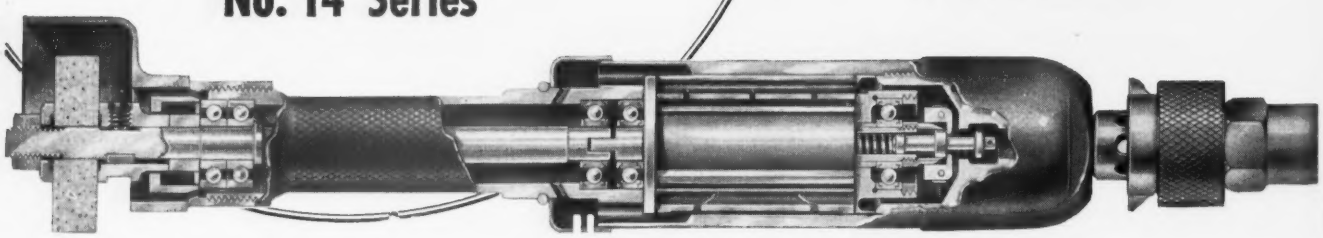
14GQ-180 GRINDER

14GEQ-170 GRINDER

14GEQ-140 GRINDER



14GEL-140 GRINDER



Featuring a new, more powerful motor, this line of tools is excellent for heavy duty grinding on small castings and many other foundry finishing jobs. They may be used with cup wheels for close-quarter grinding.

They are fast, rugged and maintenance-free. Write us for a demonstration.

SPECIFICATIONS

Length	8 to 14½ inches, depending on style
Weight	2¾ to 4¼ lbs.
Free motor speed	9,000 to 17,000 rpm
Size wheel, max.	2 to 3 inches, depending on free motor speed
Type of throttle	Thumb, lever or Quick-As-Wink optional

CLECO AIR TOOLS

CLECO

PNEUMATIC DALLETT ACCESSORIES

Division of REED ROLLER BIT COMPANY

5125 Clinton Drive Houston 20, Texas

AIR TOOLS AND ACCESSORIES

Grinders • Sanders • Rotary Drills • Riveters • Backfill Tampers
Chippers • Scaling Tools • Nut Runners • Impact Wrenches
Screwdrivers • Sump Pumps • Paving Breakers • Spike Drivers
Air Line Accessories and Fittings

5063-A

For cleaner castings at lower cost... use RESINOX

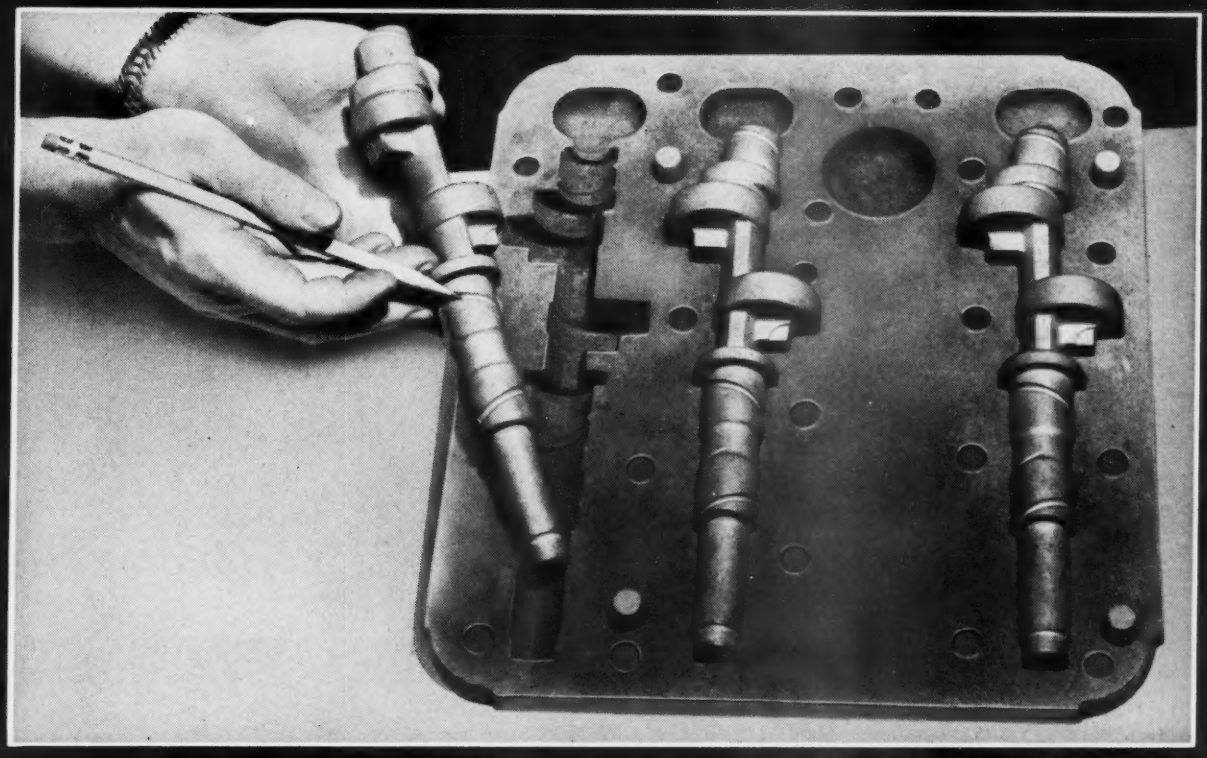


Photo courtesy of Century Foundry Co., St. Louis, Mo.

As an experienced foundry man, you know that the quality of your shell molds depends on the quality of the bonding resins used. That's why leading foundries prefer Monsanto's *Resinox** shell molding resins. The results speak for themselves – like the clean, close-tolerance casting shown here.

Because of built-in characteristics, Resinox helps produce superior castings, clean stripping and closer tolerances with low resin-to-sand ratio. You can expect stronger, better-bonded shells which mean faster production, less finish-machining and fewer rejects. Resinox helps you take fullest advantage of the superior quality and production savings inherent in the shell molding process.

For complete information on shop-tested Resinox shell molding resins: phenolic and Resimene* urea resins for core binding; and Lytron* sand conditioner for conventional sand casting, mail this convenient coupon today.

* Reg. U. S. Pat. Off.

MONSANTO

SERVING INDUSTRY WHICH SERVES MANKIND

MONSANTO CHEMICAL COMPANY, Plastics Division, Room 5709, Springfield 2, Mass.

Please send me complete information on:

☐ Resinox phenolic shell molding resins ☐ Resinox phenolic core binding resins

☐ Resimene urea core binding resins ☐ Lytron sand conditioner

Name & Title

Company

Address

City, Zone, State

Where Quality And Mass Production Go Hand-In-Hand...

No Other Foundry Flask Gives You All 4 Features!

1. Continuous welding of bearing strips—inside and out.
2. Cast steel trunnions.
3. Cast steel pinlugs and clamplugs.
4. Elimination of corner stresses.

"PERFECTION" Flasks—

Designed By Foundrymen For Foundrymen!

...BS&B "PERFECTION" FOUNDRY FLASKS ARE *FIRST CHOICE!*

One of the nation's largest and most up-to-date foundries is that of the new Fairbanks-Morse pump manufacturing plant in Kansas City, Kansas. This single plant is equipped to manufacture *annually* enough pumps to move 35,000,000,000 gallons of fluid per day!

Naturally, a manufacturing operation like this requires a tremendous quantity of castings . . . up to 70 tons a day . . . and each casting must be of the highest quality!

When it came to selecting the foundry flasks that could stand up under this kind of service, and which would consistently turn out quality castings, year in and year out . . . BS&B "PERFECTION" flasks were *first choice!*

Like Fairbanks, Morse & Co., hundreds of foundries throughout the nation are getting better castings—and at lower cost—because they're using the flask that lasts . . . BS&B "PERFECTION"! Why not give them a trial in your foundry? Once you *try* them, you'll always *buy* them! Let your BS&B Representative give you the facts.

EFFICIENCY OVER 60 YEARS BS&B RELIABILITY

BLACK, SIVALLS & BRYSON, INC.

Foundry Flask Division — Dept. 7-AR10

7500 East 12th Street Kansas City 26, Missouri

WEIGHS 28 LB

LIFTS 1,000!

KELLER AIR HOISTS

Lightness in weight is an advantage you get when you LIFT WITH AIR. One man easily carries a Keller Air Hoist up a ladder and hangs it . . . thus it is easy to move from place to place in the shop, and to service.

POSITIVE CONTROL OF THE LOAD—The Keller Air Hoist operates with an air valve, so it has an infinite number of speeds from the merest "nudge" to 17 fpm. Spotting is easy and accurate with the positive displacement motor and mechanical brake that locks the load in place.

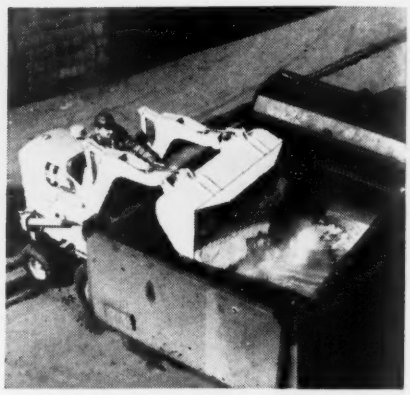
LOWER MAINTENANCE COSTS—An air motor cannot burn out—from overload, stalling, continuous use, or too frequent reversals. Thus the use of air hoists usually brings a substantial reduction in down time and expense.

Available in 3 capacities—300, 1,000, and 2,000 lb. For full information, ask for Catalog Section 86.

KELLER TOOL COMPANY

1323 Fulton St., Grand Haven, Mich.

Higher dumping clearance of 4'6" under lip (6'8" under hinge) puts higher equipment, bins and hoppers within convenient reach.



Flared 55" wide bucket lip and full 45° bucket angle when in dumping position (both greater than other loaders) aid discharge.

Reaches higher and farther

to bring you lower bulk handling costs

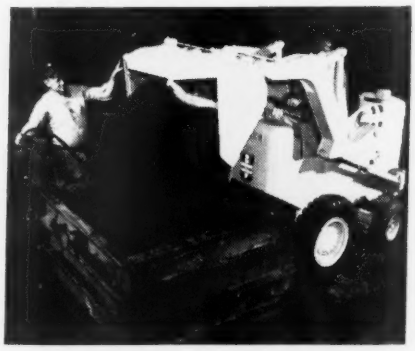
Dumps over edges to 6' 8" high, reaches up to 4" farther; 45° dumping angle aids discharge

The extra reach and clearance of the Jaeger Auto-Scoop make it possible to dump into higher bins, hoppers, trucks . . . to place loads accurately, where you want them. 4'6" clearance under bucket lip, 6'8" under hinge and longer reach of 2'7" are all greater than comparable 12 cu. ft. scoop loaders.

The Auto-Scoop easily handles 1200 lbs. (up to 20% more than other loaders of its size) at all dumping heights and positions. Boom arms and bucket are under finger-tip hydraulic control. Double-acting pistons dump and retract the bucket, discharge fast or slow as needed, enable operator to reach over edge of bins, dump and retract before returning, and can rack or shag bucket clean of sticky materials. Flared 55" wide bucket lip and 45° dumping angle insure cleaner, faster discharge.

Specifically designed for most efficient scoop loader operation, the Auto-Scoop also offers shortest turning radius (6'6"), greater power (33 hp @ 1800 rpm), up to 25% faster speeds, lowest bucket tilt-back, lower carry and other features that contribute to overall gains in production. Write for Catalog L12-4 and name of distributor who sells and services the Auto-Scoop in your city.

(Comparisons based on other well-known scoop loaders now in the field).



Extra inches provided in both forward and vertical positioning help operator spot loads accurately, with minimum effort.

Drums, bags, small parts and many other materials are also economically handled. Here the Auto-Scoop also stacks its load.

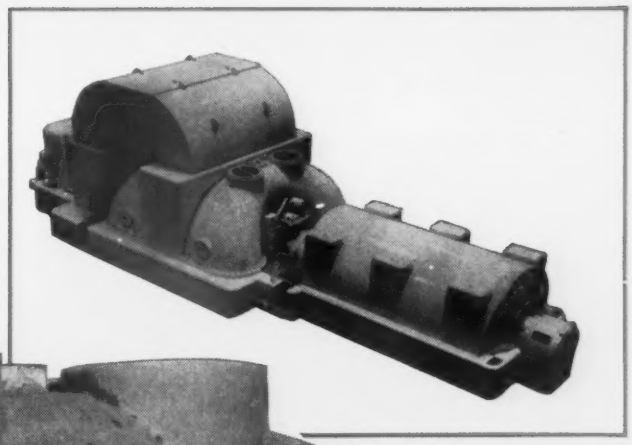
For bigger work, Jaeger offers the 1 cu. yd. Load-Plus, with torque converter, power steering and either front-wheel or 4-wheel drive.

The Jaeger Machine Company, 502 Dublin Avenue, Columbus 16, Ohio

JAEGER LOAD-PLUS *auto-scoop*

AIR COMPRESSORS • PUMPS • MIXERS • PAVING MACHINES

Distributors throughout U.S. and Canada and Principal Cities of the World



This General Electric steam turbine generator can produce enough electric power to supply light for a city of 400,000 people.

Chateaugay Pig Iron Used

In Casting 55-Ton Exhaust Hood

Castings like this huge turbine exhaust hood are produced regularly by General Electric.

Their foundry specifications are strict. To meet these requirements they use only the finest pig irons in their cupola mixture—including Republic Chateaugay.

Many casting producers use Chateaugay iron to obtain high strength, uniformity and machinability throughout every casting. Chateaugay castings have an unusually fine and uniform grain structure, and surfaces with high wear-resistance.

In addition, Chateaugay castings machine easily and economically.

For the complete story on Chateaugay, the low-phosphorus, copper-free pig iron, call in a Republic Pig Iron Metallurgist. There is no cost or obligation for his services. Let us know when you would like him to call.

REPUBLIC STEEL CORPORATION
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N.Y.

REPUBLIC PIG IRON

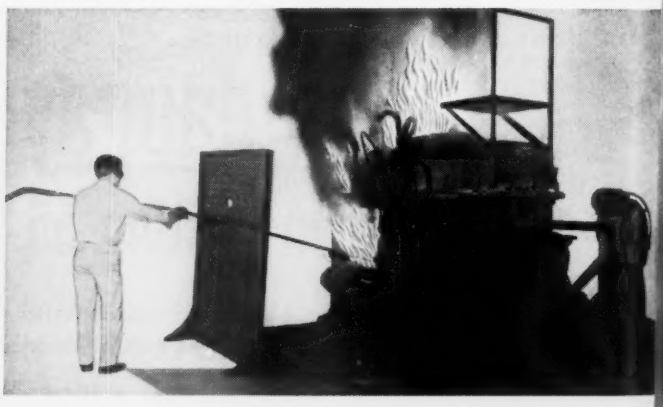
"CHATEAUGAY"	REPUBLIC	REPUBLIC
Low-Phosphorous, Copper-Free	(Northern) Foundry, Bessemer Basic and Malleable	(Southern) Foundry and Basic

REPUBLIC STEEL

Airco Oxygen Tent for Industry

The vital importance of oxygen to industry is relatively new. Forty years ago, the market for oxygen in cutting and welding and allied uses was virtually nonexistent. The rapid growth of industrial oxygen consumption has been nourished by three conditions: an expanding economy, the wider use of *any* effective product in healthy conditions of economic expansion, and the development of new and improved tools and techniques whose effectiveness depends on oxygen. For details of these and other applications of Airco products, write for a sample copy of the magazine, "Airco in the News."

Oxygen in the glass industry — Insatiable demand for light bulbs, electronic tubes, and similar glass components has brought modern mass production methods to the old art of the glass blower. This "sealing-in" machine at Sylvania Electric Products, Inc. seals bulbs and mounts into 150-watt inside frosted incandescent lamps at a 1500-per-hour rate. A mixture of oxygen-enriched air and natural gas provides the right flame shape and temperature in the jets that soften the throats of the bulbs prior to sealing.



Needling steel for production economy—Oxygen has replaced iron ore as an oxidizing agent in most steel mills with electric furnaces. Here at Mid-Continent Steel Castings, Shreveport, La., a long pipe injects the oxygen directly into the molten steel. Advantages of this Airco-pioneered process are savings in time, power, furnace electrodes and valuable alloy elements. Other oxygen applications include flame cutting of heavy scrap, scarfing, flame cleaning, oxyacetylene welding, dehydrating, hard-facing, and gas hot topping of ingots.

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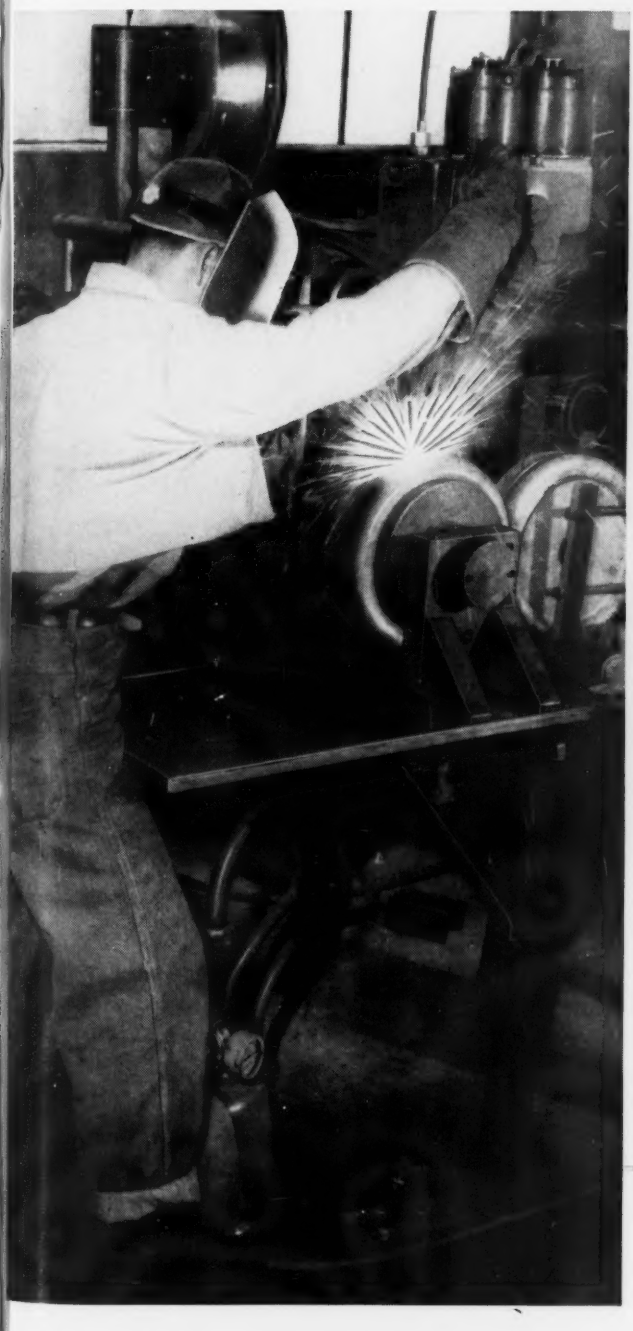
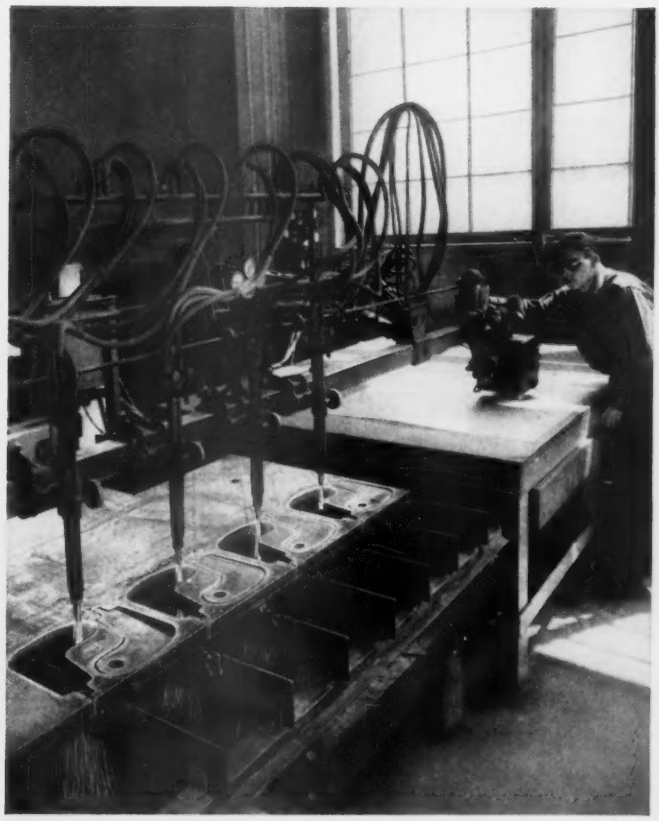
Delivering industrial "breath"—Oxygen supply and servicing is as important as its unit price and purity. Airco customers get a dependable, flexible supply service from a network of 70 producing plants situated strategically throughout the country. Delivery, by bulk truck (far right), in cylinders, or by direct pipeline is quick and dependable. Right: valve opening ceremony last year at the new Airco liquid oxygen plant, Butler, Pa. These pipelines deliver oxygen to Armco Steel and Pullman Standard steel plants.

New welding process speeds production – Among industry's newest production tools is the Aircomatic® process. The method greatly increases the speed with which good welds can be made in a wide variety of metals and alloys, including "problem" materials like aluminum and stainless steel. This photograph shows the inert-gas-shielded metal arc of an automatic Aircomatic head welding truck-trailer dolly wheels from press-stamped SAE 1020 steel at Youngstown Steel Car Corp., Niles, Ohio. Oxygen plays an important part here as an additive to the shielding gas.





Most dramatic use of oxygen – Flame cutting is perhaps the most spectacular industrial application of oxygen... as useful as it is striking. The oxygen-acetylene flame used generates 6300°F-heat. This temperature permits cutting metal thicknesses ranging from sheet to heavy ingots. Here, an operator at Brown-Wales Co., New England steel warehousing firm, cuts steel plate with an Oxygraph equipped with Electronic Tracer, one of the Airco precision machines that has brought flame cutting to a peak of usefulness.

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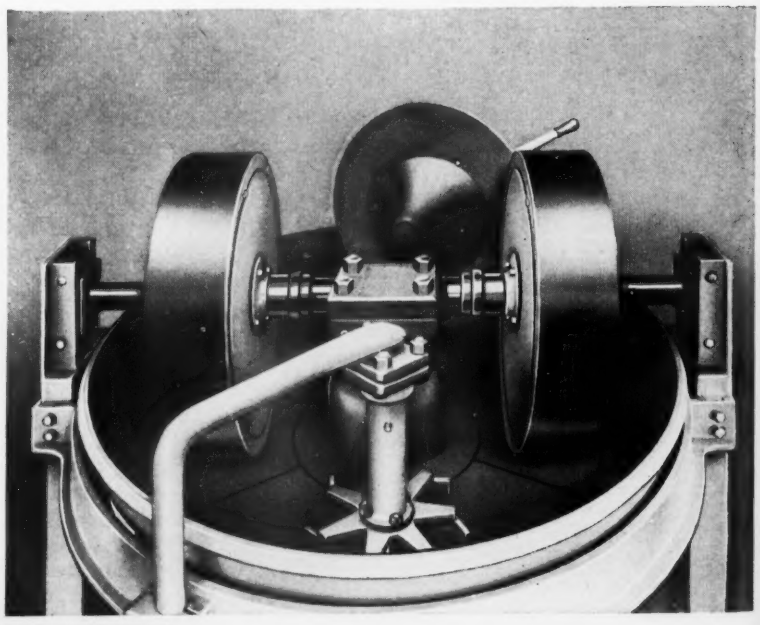

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Rotor type cup wheel—cross section shows steel bushing flange and safety ring.

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AAF Furnace Hoods have been designed for all makes of electric melting furnaces (top and side charge) from ½ to 75-ton capacity. The circular hood is attached to the furnace roof ring so as to permit full operation without hindrance. Metallic fumes and dust are removed at their source, permitting complete foundry ventilation with minimum movement of air and use of power.

The AAF AMERjet is the ideal exhauster-collector for such service. This reverse jet type fabric dust arrester is particularly suited to the handling of gases and fine particles. Like all AAF Dust Control Products, it combines high collection efficiency with small space requirements, maintained performance over a wide range of operating conditions and constant exhaust volume.

Act now before another winter season finds you confining this smoke and dust behind closed doors and windows. Let this proven AAF combination make your electric melting furnace the brightest, cleanest operation in your foundry. A call to your local AAF representative will start the ball rolling—fast.

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Colonial America Is Alive Again

This time the setting is Saugus, Massachusetts where the first iron furnace ever to be operated on this side of the Atlantic has been rebuilt. It stands now just as it did in 1653 on the old foundations of the original works, a perfect replica of the plant that was pioneered by John Winthrop, Jr.

The old town was originally called Hammersmith. You could spend a charming day visiting there and reliving the days of long ago. The iron master's house, sole survivor of the original buildings, has been refurnished in the period it served. It has wide hearths, candles for lighting, and trundle beds. The furnace itself is complete with a huge water wheel to furnish power for the air blast. This air is forced through the furnace by two leather bellows flexing alternately to provide constant pressure. A separate building houses the forge plant and there a second water wheel powers the hammer. Another point of interest is the museum where parts of an original water wheel are on display together with tools, iron fittings and other artifacts salvaged from the excavations. Here too you can learn something about the restoration work which involved the moving of streets, digging for the old foundations, and endless research work in those parts of England from which the original workers and tools came.

Now the iron industry has a national shrine and those who are fortunate enough to visit there will be impressed with the generous planning of the American Iron and Steel Institute which made this restoration possible. We will be glad to mail a folder which tells of the Saugus Iron Works restoration on request.

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May we send you a new folder which tells the whole story of Korbond core oils. There is a real reason why they

(1) Build top strength
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Tough problems have been solved with the right grade of Korbond, problems arising from uncontrolled ovens, high temperature pouring, and from cores that are delicately formed and baked in inset driers. These have been met and dealt with in the use of Korbond core oil. Your problem may be a different one, but we would welcome the chance to offer our service.

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THE CINCINNATI MILLING MACHINE CO.
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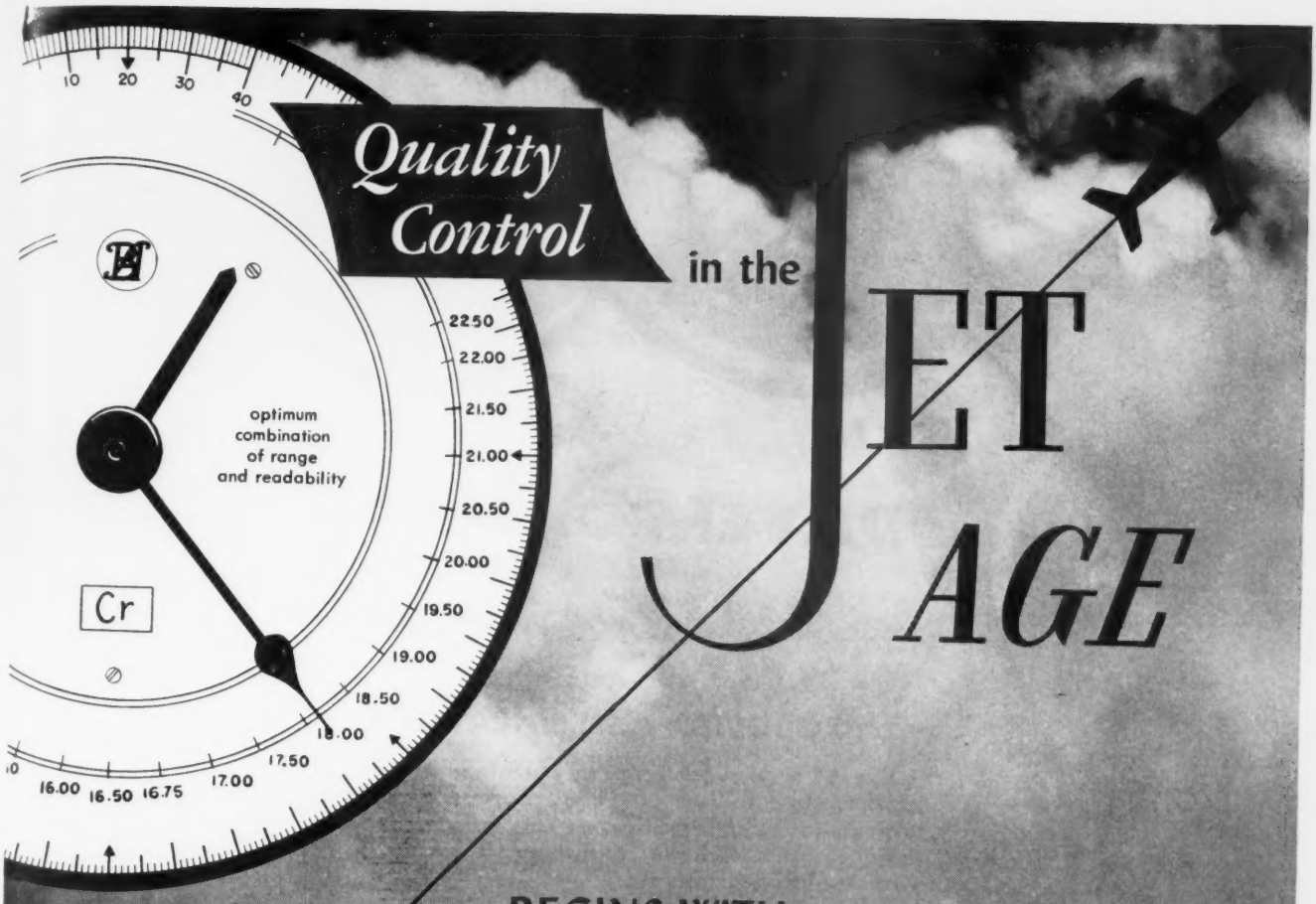

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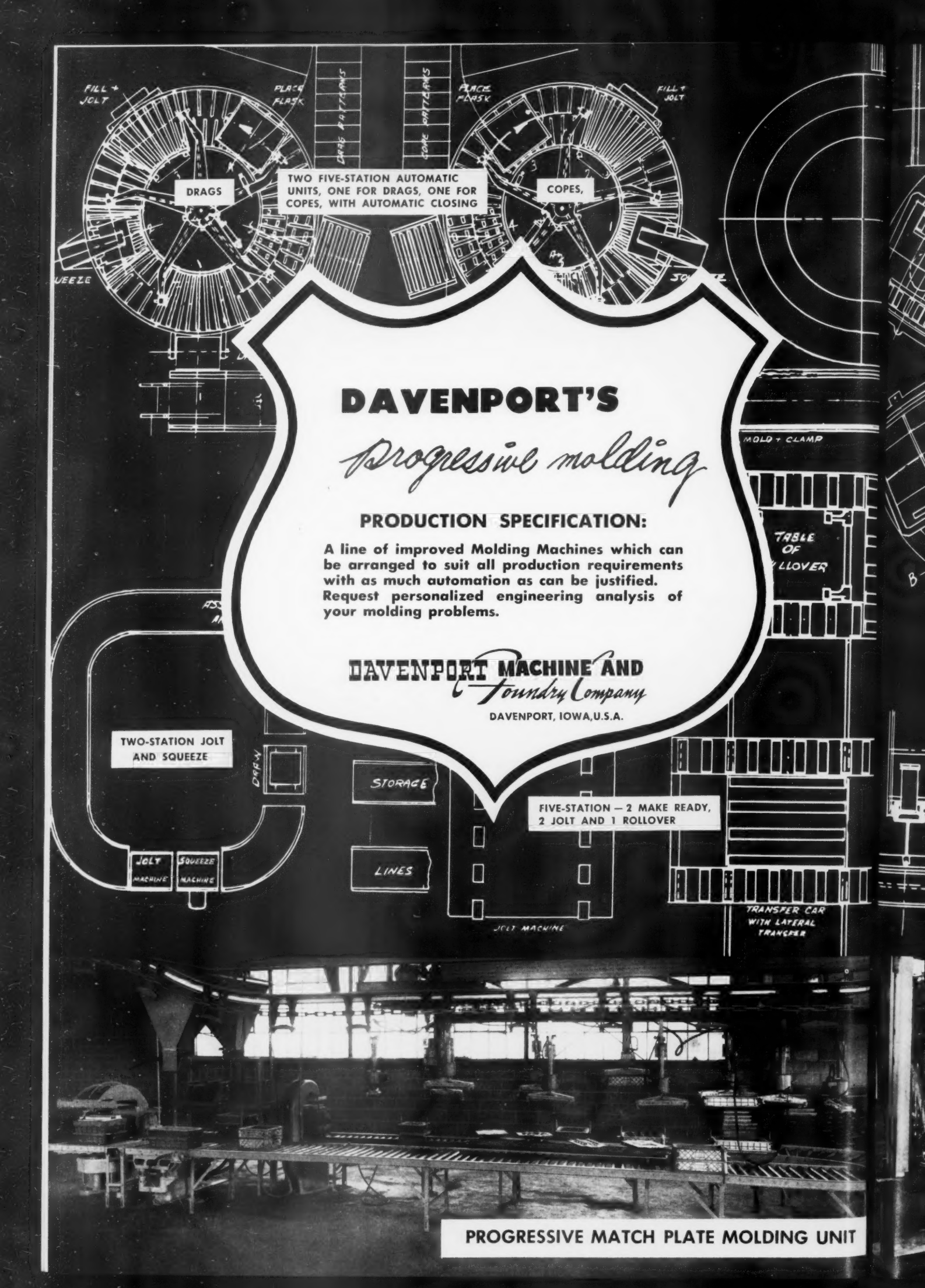

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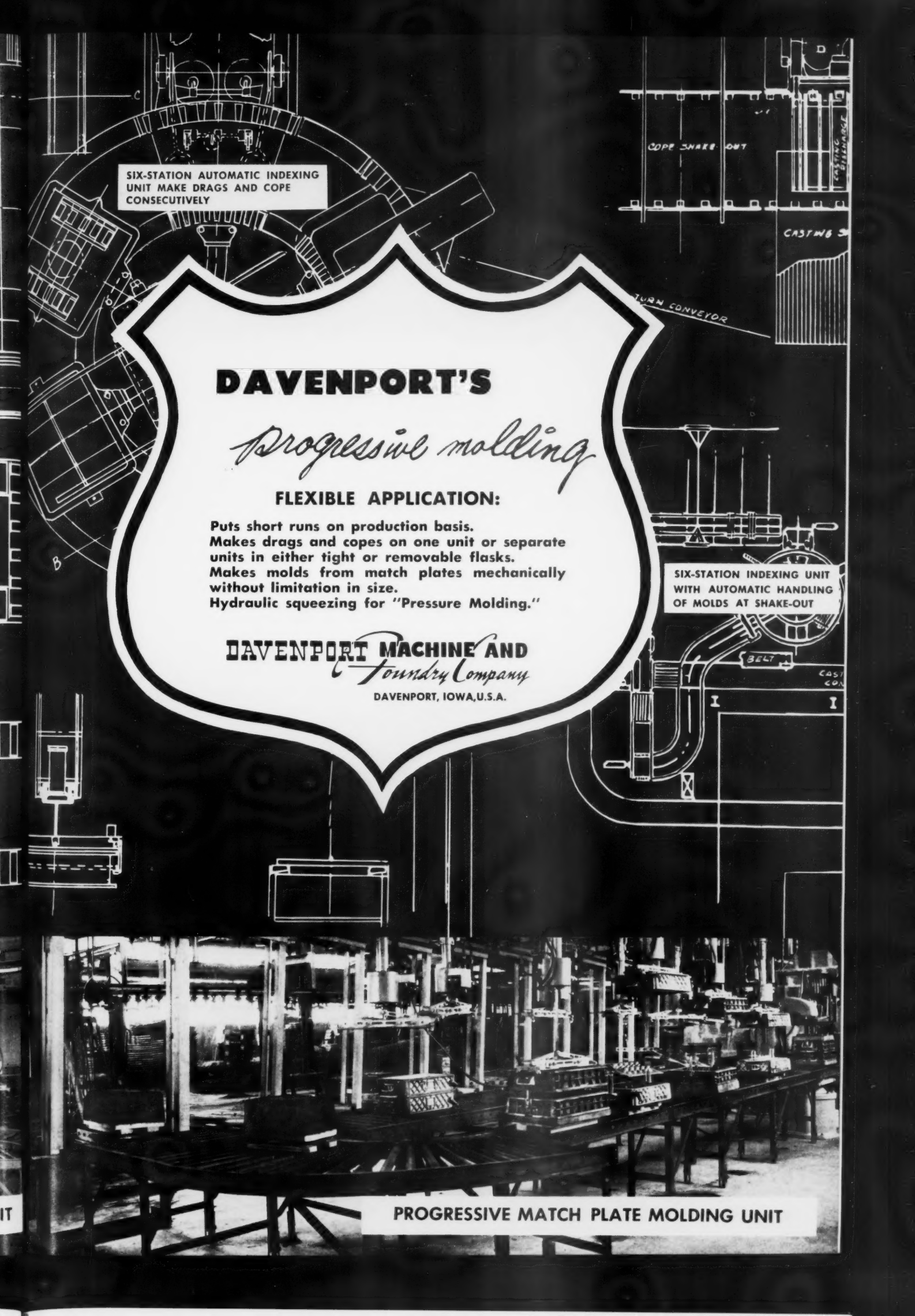
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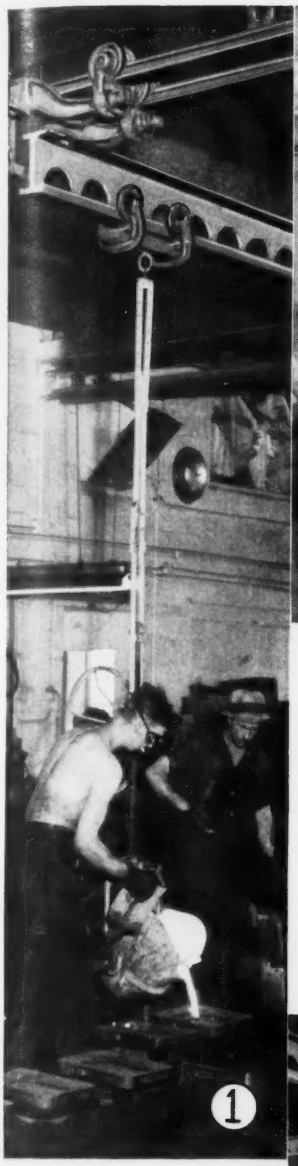

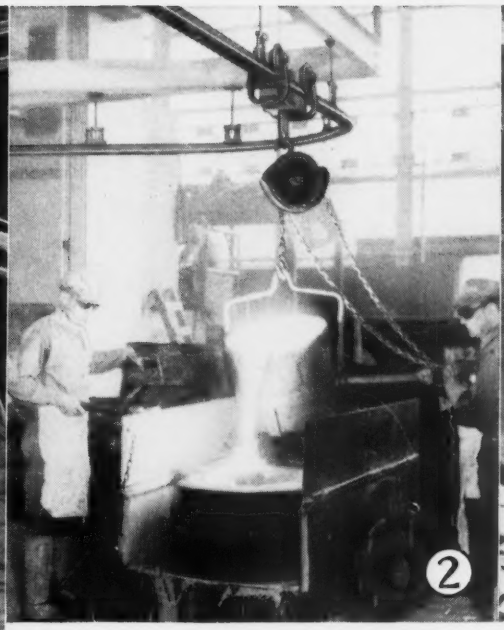

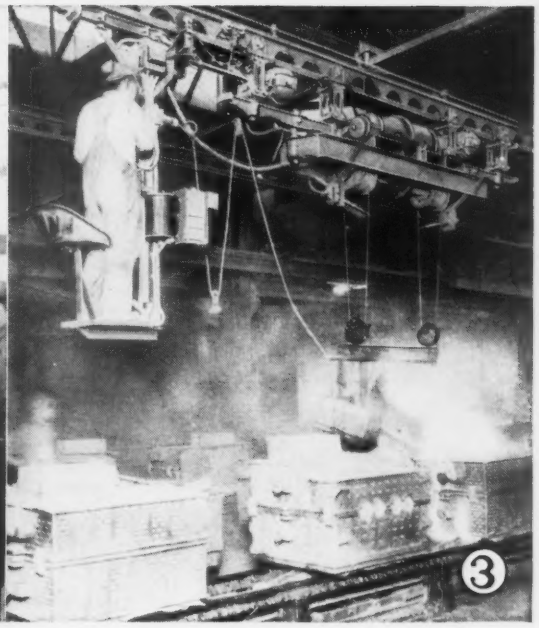

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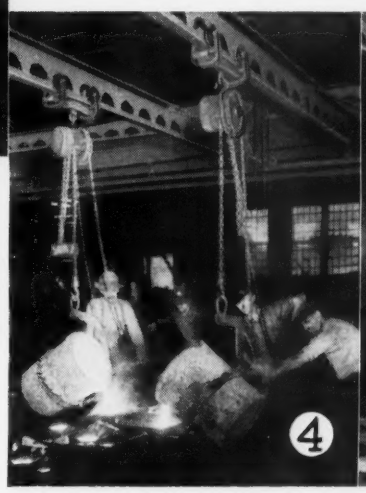

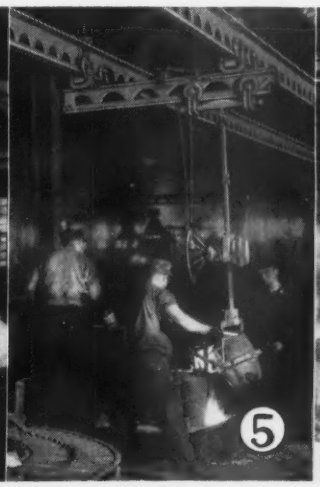

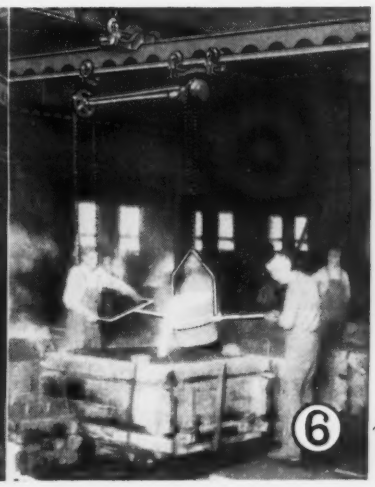

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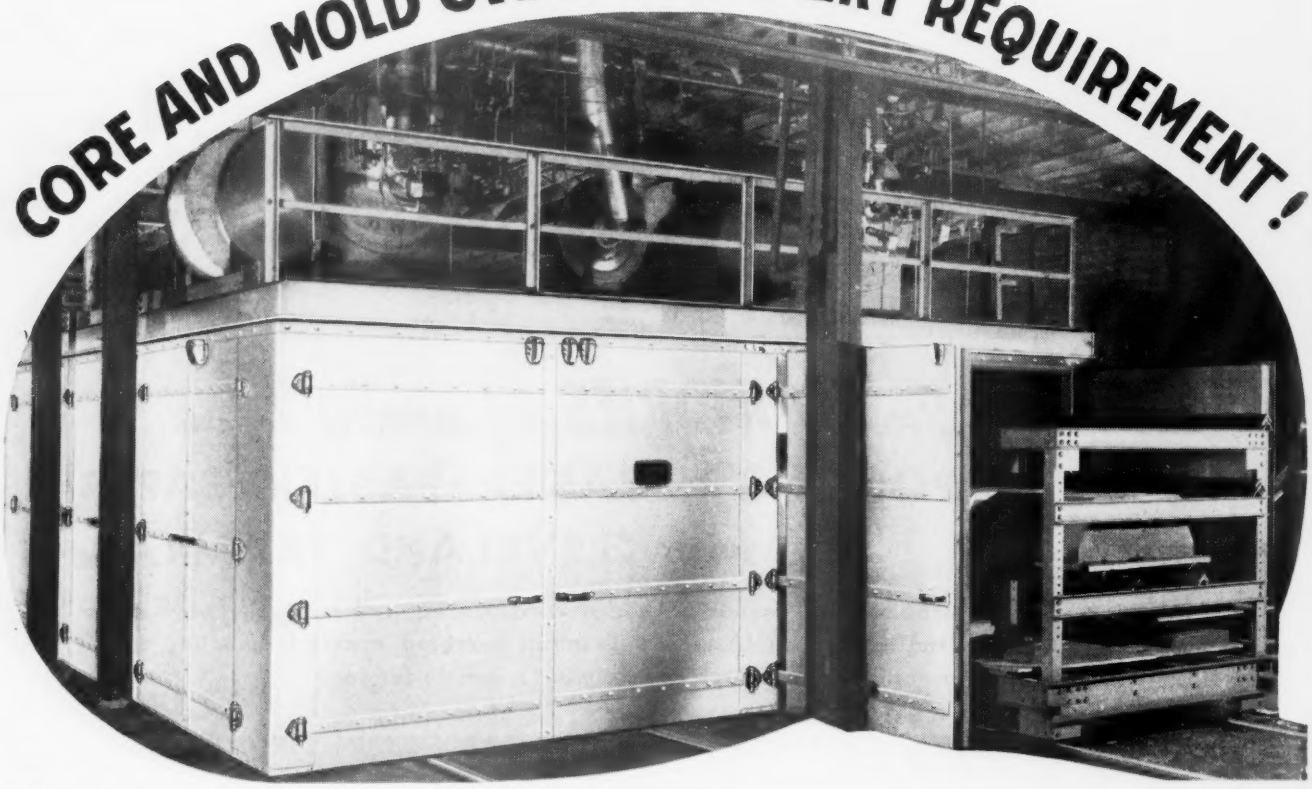

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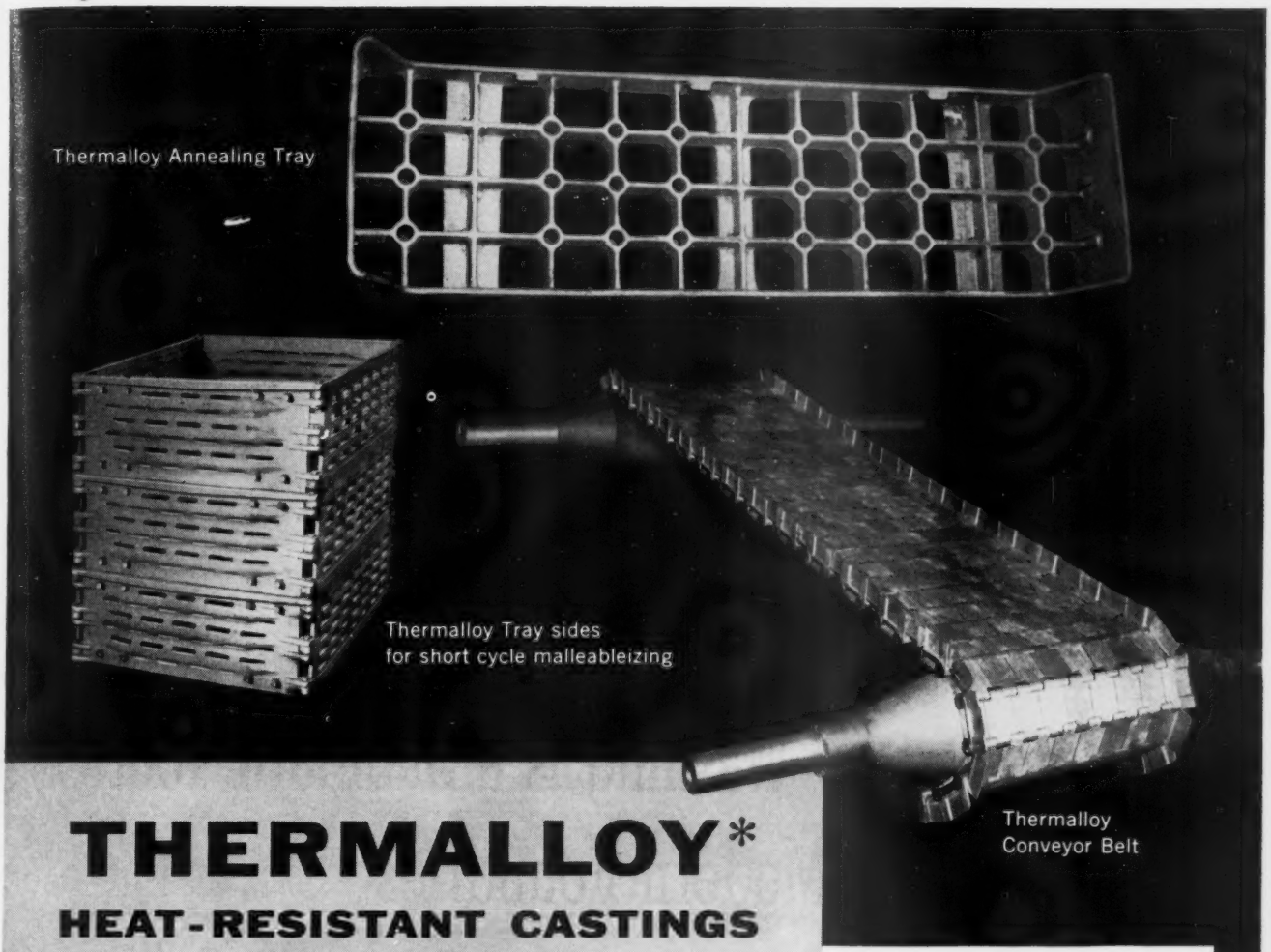

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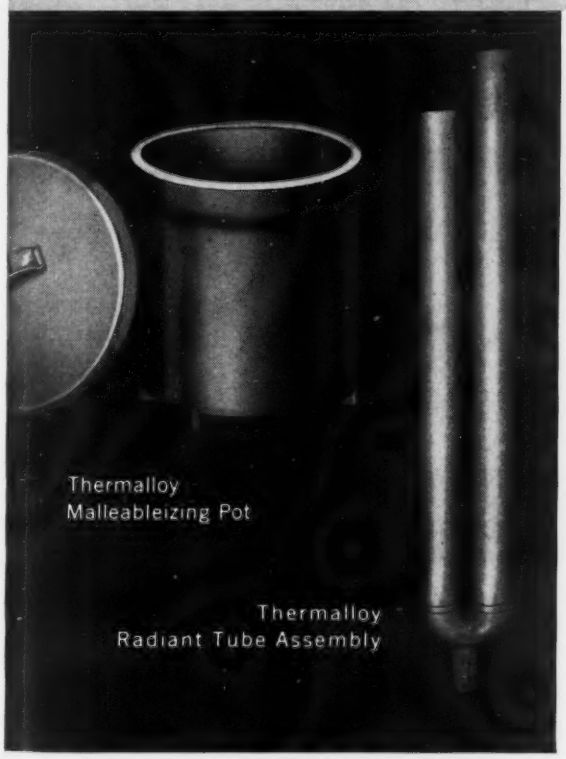
HEAT-RESISTANT CASTINGS



Can help cut heat-treat costs

Here are a few of the many high heat-resistant Thermalloy castings that can help you cut heat-treat costs. Whether it's a standard tray, basket, pot or radiant tubes . . . or a specially-designed unit or furnace part . . . investigate Thermalloy's heat and abrasion-resistant properties.

Thermalloy is a group of tough, heat-resistant alloys specifically developed to take heavy loads and rough usage . . . to resist corrosive gases, excessive heat (up to 2100°F.) and abrasion.

At Electro-Alloys, a competent engineering and metallurgical staff will be glad to help you utilize Thermalloy castings to best advantage in your plant. Call your nearest Electro-Alloys Office or write Electro-Alloys Division, 5008 Taylor Street, Elyria, Ohio, for complete information available in Thermalloy Bulletin T-225.

*Reg. U. S. Pat. Off.

AMERICAN Brake Shoe COMPANY

ELECTRO-ALLOYS DIVISION
ELYRIA, OHIO

Powder-washing blowpipes have replaced swing grinders and chippers in removing defects and riser pads from railroad diesel trucks. Work is done faster and more efficiently—preheating is rarely necessary.

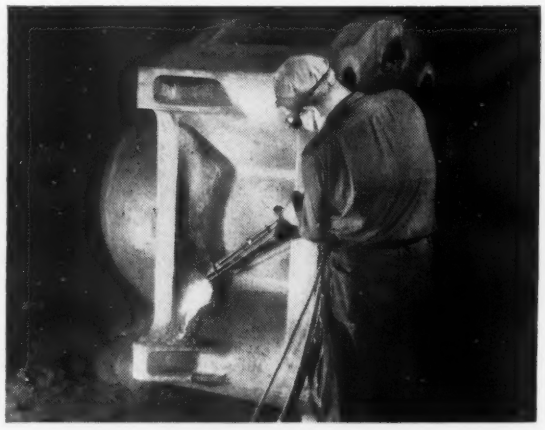
Powder-washing blowpipes remove riser pads in locations virtually impossible for other methods. Risers between flanges of this valve body have already been washed away—note the smooth clean finish.

Why Powder-Washing is a Standard Tool in Modern Foundries

Powder-washing is the fastest, most efficient method for gouging and removing fins, pads, and stubs from casting surfaces and hard-to-reach places.

* Powder-washing is faster than grinding or chipping, and finished surfaces are clean and smooth.
* Powder-washing tools are quiet, easy to operate, and less fatiguing than chipping tools and grinders.
* In powder-washing, metal powder is added to the washing flame. This raises its temperature, and provides greater speed and control in cleaning sand and metal from castings. This process is effectively used to gouge or wash iron, steel, bronze, and some of the more complex oxidation resistant alloys.

Your local LINDE representative will be glad to give you detailed information on the powder-washing process, and help you determine the setup to best serve your foundry needs. Save time and money—call him today.



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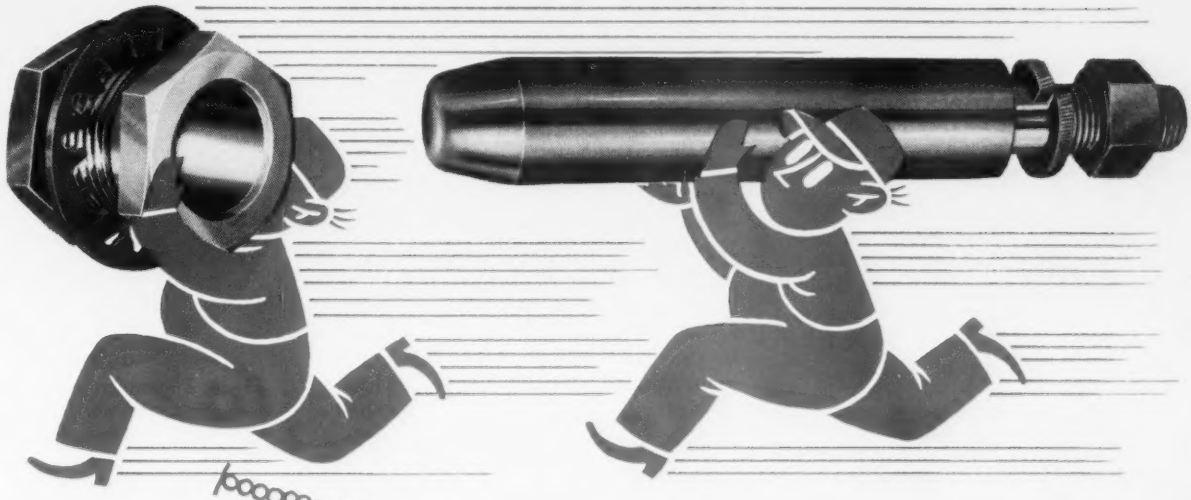

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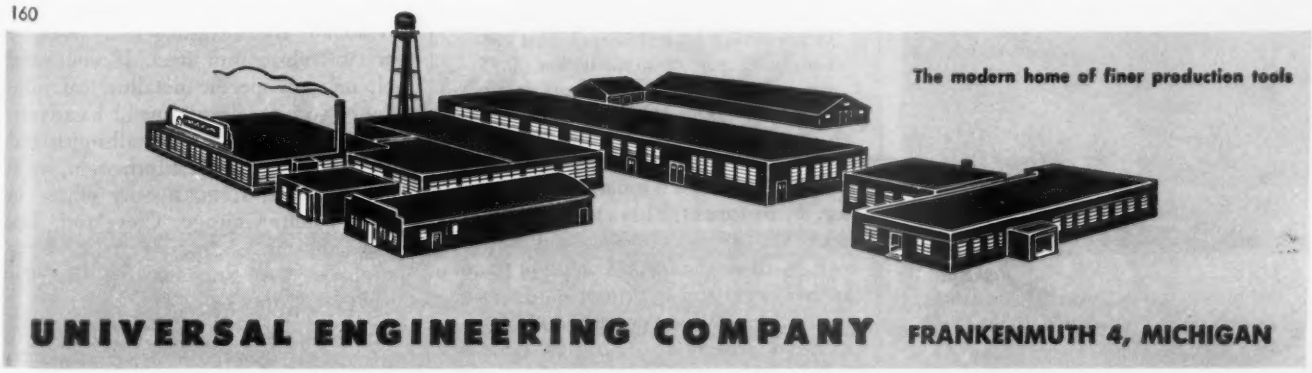
Universal Flask Pins and Bushings save precious minutes of production time because they assure instant, accurate alignment of cope and drag. And they also save down-time because, being heat-treated and precision ground from fine quality steels, they stand up under rough treatment and give long, satisfactory service. Universal threaded series Flask Pins and Bushings are used in steel, aluminum, magnesium or other light metal flasks. Bushings are available in both the round and elongated types; pins in both round and hexagonal types. Universal carries a complete line of sizes of its threaded series as well as its taper and plain series Pins and Bushings as regular stock items. For further information write to the Universal Warehouse nearest you — 1060 Broad St., Newark, N. J., 5035 Sixth Ave., Kenosha, Wisc., or the home office.

160



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ELECTROMET Data Sheet

A Digest of the Production, Properties, and Uses of Steels and Other Metals

Published by Electro Metallurgical Company, a Division of Union Carbide and Carbon Corporation, 30 East 42nd Street, New York 17, N. Y. • In Canada: Electro Metallurgical Company, Division of Union Carbide Canada Limited, Welland, Ontario

Why 3 Per Cent Chrome Steel Makes Good Castings for Wear Resistance

Castings of 3 per cent chromium steel have been used in substantial tonnages, for many years, for various equipment parts demanding good wear resistance. Such castings offer an excellent combination of hardness and toughness. Typical applications are crusher parts used in rock- and ore-crushing equipment, swing hammers for pulverizing coal, railroad switch frogs, gears, pulleys, sheaves, and other castings that must meet severe conditions of wear.

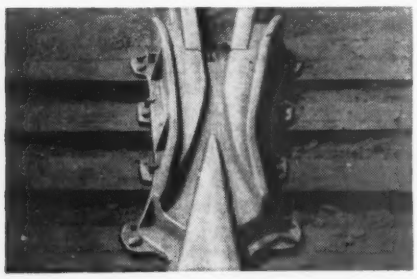

Fig. 1. Railroad switch frogs, which are subject to severe wear, give outstanding service when cast of 3 per cent chromium steel.

The 3 per cent chromium steels, are normally produced in a carbon range of 0.30 to 0.50 per cent. They exhibit excellent depth-hardening properties, which simplify heat-treatment and insure uniformity throughout heavy sections. The analysis is usually modified by a molybdenum addition, since this element aids in increasing hardenability.

Fig. 2. Grating for top of shake-out machine is cast of 3 per cent chromium steel to give good wear resistance and long life.

Properties Improved by Heat-Treatment

The best properties of 3 per cent chromium steels are developed through heat-treatment. Generally, this consists of a normalizing treatment from 1650 deg. F., followed by tempering in a range between 1000 and 1250 deg. F., depending on the physical properties desired. Double normalizing is sometimes used to obtain further improvement in the grain structure. With carbon on the high side of the specification, air-quenched castings show a Brinell hardness number of over 400 in 3-inch sections. This hardness is practically uniform throughout the section. Oil quenching is employed to produce higher hardness and depth of penetration, and even in a 4-inch section, a hardness number of over 500 Brinell is obtained.

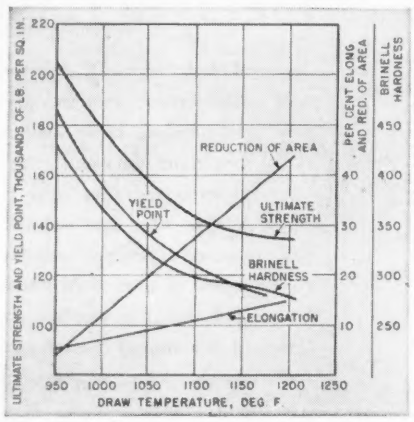

Fig. 3. These curves show the response to tempering of a 0.37 per cent carbon, 2.93 per cent chromium, 0.35 per cent molybdenum steel previously normalized from 1650 deg. F.

The steel also shows good response to tempering. After a normalize and a 1100 deg. F. treatment, it has a tensile strength close to 150,000 pounds per square inch, with an elongation value of about 12 per cent, and a Brinell hardness of about 300. When greater ductility is required, tempering should be done at higher temperatures. However, in such instances, some strength and hardness are sacrificed.

Fig. 4. Photomicrograph of 3 per cent chromium steel normalized from 1650 deg. F. and tempered at 100 deg. F. (X250). The pseudo-martensitic structure is well suited to resist abrasion.

Effect of Other Alloy Additions

Molybdenum in the range from 0.30 to 0.50 per cent will improve depth-hardening characteristics and aid in reducing susceptibility to temper brittleness in the lower temperature ranges. If the molybdenum-bearing steel contains relatively high carbon (0.40 to 0.60 per cent) additions of approximately 0.08 to 0.10 per cent vanadium provide greater uniformity in hardening. Small additions of silicon increase strength and hardness and this element is sometimes increased to 0.80 or 1.00 per cent. Manganese is added in amounts between 0.50 and 0.80 per cent.

Metallurgical Service Available

When you have occasion to produce castings for applications involving severe abrasion and wear, it will pay you to investigate the advantages of using 3 per cent chromium steel. If you need help on some specific metallurgical problem, be sure to consult one of ELECTROMET's specially trained metallurgists and engineers. For further information, write to the nearest ELECTROMET office: in Birmingham, Chicago, Cleveland, Detroit, Los Angeles, New York, Pittsburgh, or San Francisco. In Canada: Welland, Ontario.

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Sand IS ONLY PART OF THE PICTURE...
Compatible as Smith L-O is with sand, we recognize that there are always certain casting conditions that require specialized attention. We suggest, therefore, that you call in a Smith representative — a man of broad, "shirt-sleeve" experience — who will study your conditions and come up with a sound recommendation on the grade of Smith L-O you should use. Take advantage of his valuable assistance for his help is further proof that Smith L-O stands also for a service as well as a product.
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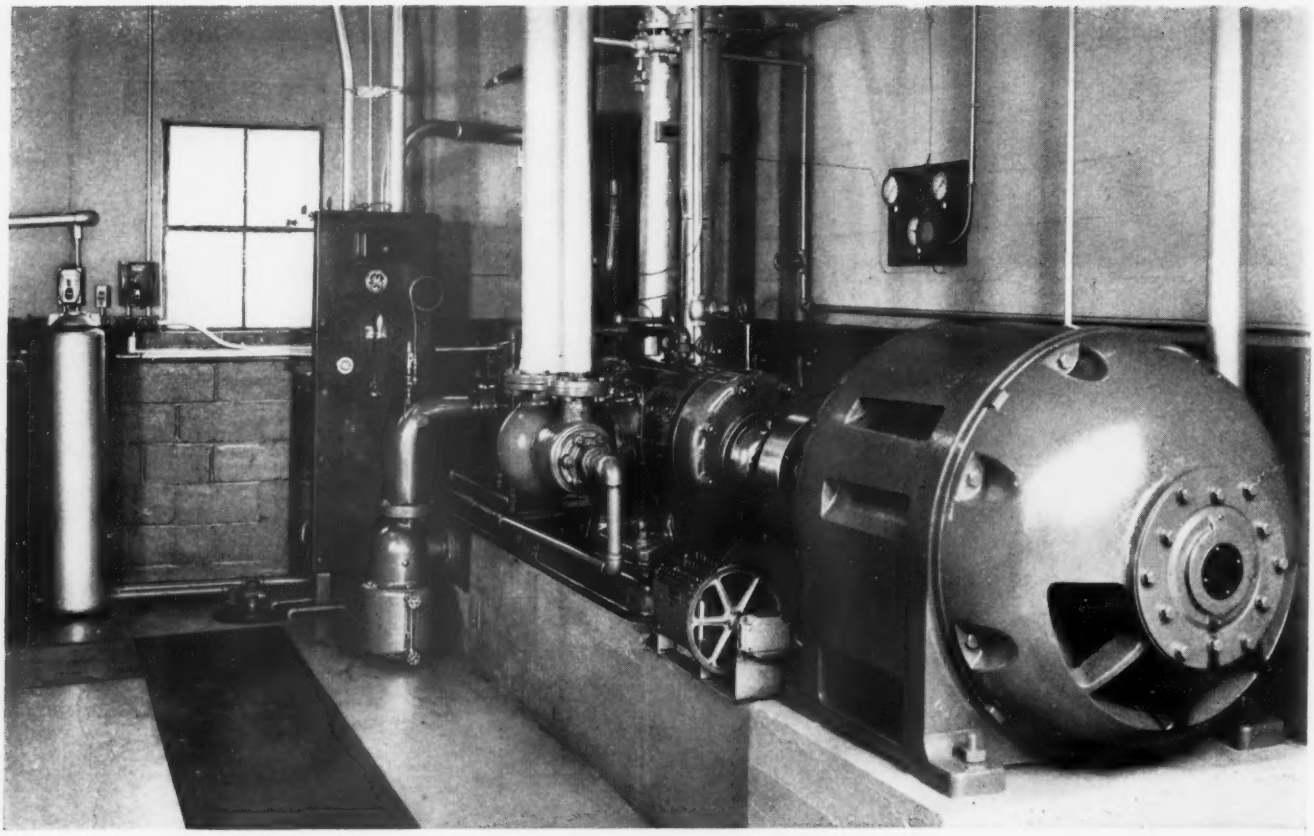

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FULLER ROTARY COMPRESSOR AT EMPIRE STEEL CASTINGS, INC.

Compressed air, supplied by a Fuller Rotary Two-stage Compressor, is used for many foundry operations at Empire Steel Castings Company, Reading, Pa. This machine has a capacity of 680 c.f.m., 100-lb. pressure.

Many operations are mechanized, using compressed air. Pneumatic rammers; squeeze and jolt machines; automatic set-out and lifting in connection with mold conveyors; automatic shakeout; mold cleaning and spraying. Drying; core oven and core blowing. Chipping hammers and grinders; blacksmith requirements; sand blasting; and pressure testing—a whole group of operations simplified by the use of compressed air supplied by the Fuller Rotary Compressor.

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In your own operation, compressed air can save time and money . . . especially when it is supplied by reliably efficient Fuller Rotary Compressors. Don't overlook the advantages of air power—put it to work.

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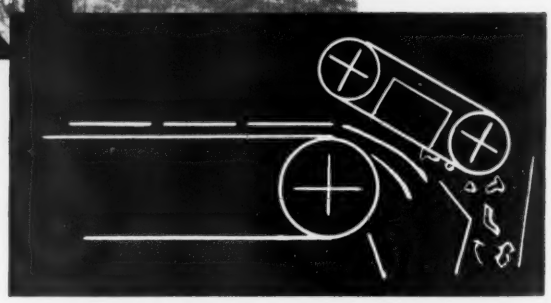
Here's one of the most important advances in magnetic tramp iron separation in years . . .

the NEW Dings "In-Line" *Self-Cleaning* SUSPENDED MAGNET

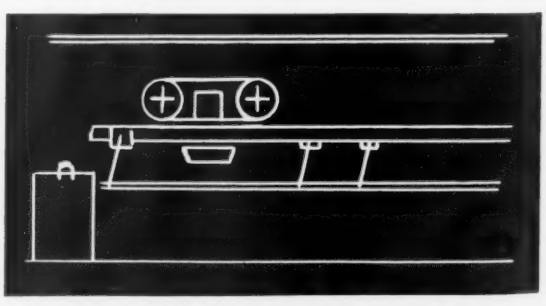
DINGS "In-Line" Magnets pull tramp iron of any shape out of conveyor belt burdens traveling at any speed. They do the job where even the largest diameter magnetic pulley would fail — where burden trajectories are almost horizontal.

Iron extraction with the Dings "In-Line" is parallel to burden travel and at the same speed. That's why this magnet can handle long iron rods with ease.

Dings "In-Line" is especially well suited for integration with pan-type conveyors being used by more and more foundries (see diagram). See your Dings representative for more information.



Dings "In-Line" extracts and discharges tramp iron in the direction of the burden flow—at the same speed as the burden moves. That's why it can pull out iron rods without tearing or gouging belts. "Selective" lifting of the iron to the magnet eliminates objectionable carryover of sand with the iron as usually experienced with magnetic head pulleys.



When used with a pan-type conveyor such as the Simplicity, Dings "In-Line" carries iron over the gap, through which the magnetically separated sand falls into a secondary conveyor, onto discharge end of conveyor.

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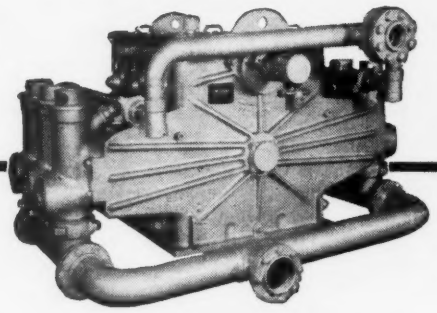
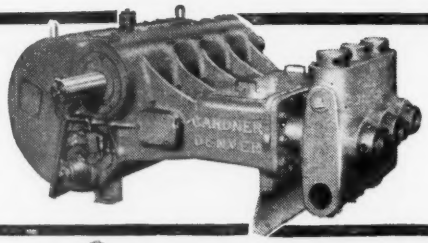
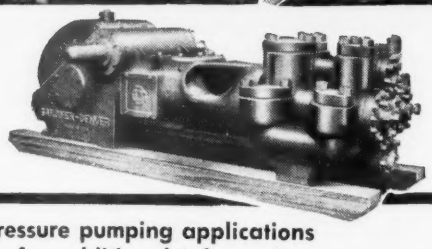


5,000 pounds maximum pressure. Capacity ranges up to 408 gpm. Model PL-7 Six-Cylinder Plunger Pump.



2,600 pounds maximum pressure. Capacity ranges up to 263 gpm. Model PA-8 Triplex Plunger Pump.



1,600 pounds maximum pressure. Capacity ranges up to 264 gpm. Model "FX" Duplex Power Pumps. Models 15 to 100 h.p.

Gardner-Denver's experience with high-pressure pumping applications may help solve a problem for you. Write for additional information.

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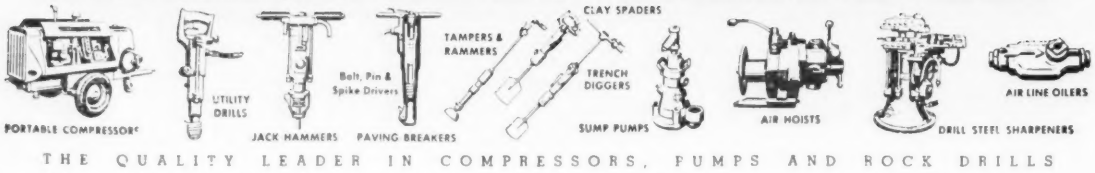

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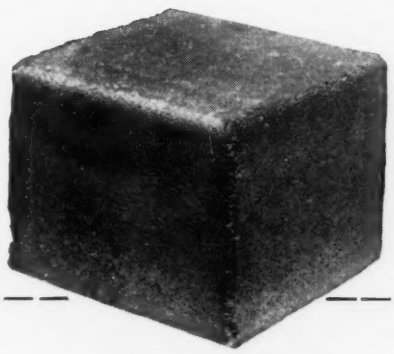

Iron deoxidized with FERROCARBO® patented Briquettes is *more fluid* at casting temperatures than untreated iron. It flows more readily into thin sections or complicated molds. You get better castings...fewer misruns. Leading foundries report up to 50% reduction in misruns after using FERROCARBO in the charge.

Deoxidizing with FERROCARBO gives you additional advantages, too: Silicon recovery increases materially. You can charge more scrap—either steel or cast iron—since FERROCARBO reduces the chilling tendency.

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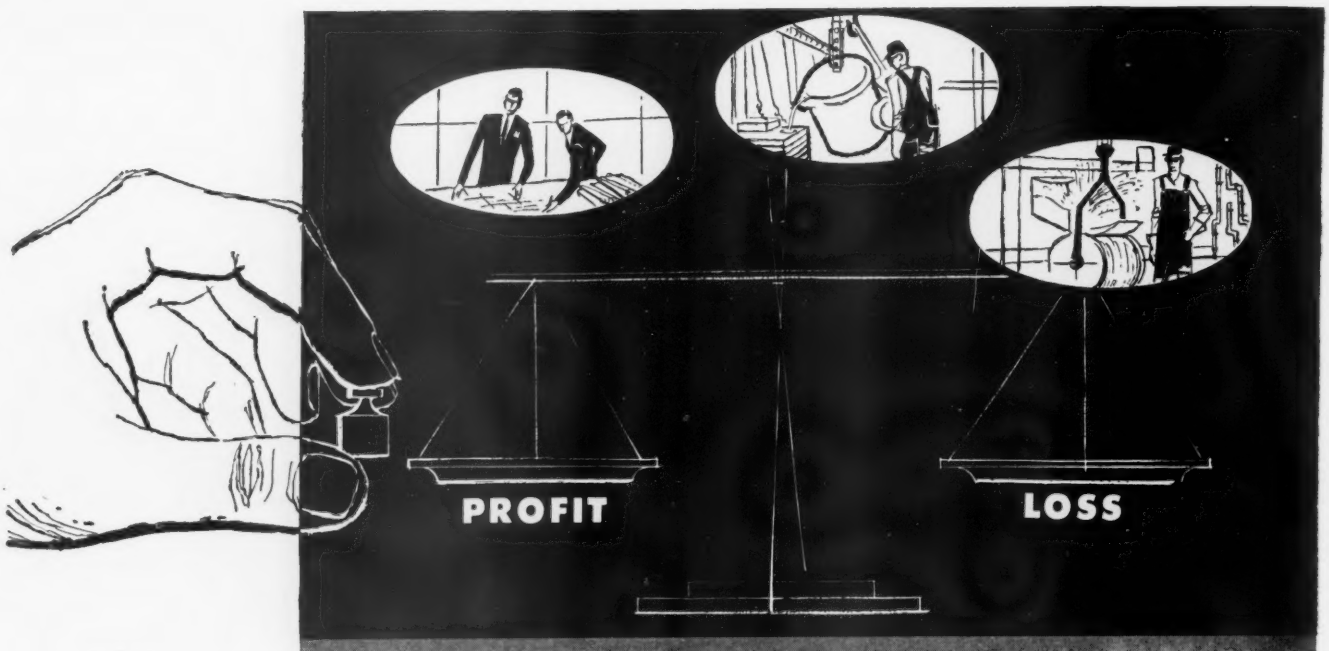

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In foundry operation, making the best use of facilities and manpower determines the balance between profit and loss.

In many foundries, management and operation audits by experienced Knight engineers have helped to swing the balance to profit—through low-cost, readily effected improvements.

A recent Knight audit for a Michigan foundry resulted in substantial production increases and reduced costs. Improvements included the installation of a conveyor which eliminated handling . . . a rearrangement which increased capacity without additional floor space . . . and automatic timing devices which brought accurate process control and increased production.

These simple low-cost changes, accomplished without interruption to production, are part of a coordinated plan which is designed for future expansion requirements.

If you are interested in an audit of your operations to establish a program of improvement, take advantage of Knight experience and call or write our Chicago or New York office for prompt attention, without obligation.

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with THIEM Mold Lite S...

Clean and Smooth

at the Shakeout!

unretouched photograph

A 16,000 pound steel casting at Riverside Foundry, Bettendorf, Iowa, as it appeared after the shakeout.

THIEM men working with Riverside foundrymen on green sand facing, sprayed with MOLD LITE S and torch dried — performed this operation completely without interruption of production.

THIEM Mold Lite S is THE ANSWER to reducing mold drying time and increasing flask turnover. The firm coating it provides will not wet back — eliminates surface sand defects and reduces cleaning time just as it has on the 16,000 pound steel casting shown here, and cast at the Riverside Foundry, Bettendorf, Iowa.

Grey iron foundries realize the same big benefits in THIEM Mold Lite G — and, where the higher refactory value of zircon is required, your foundry can use THIEM Mold Lite Z.

Call in your THIEM representative — he's a foundry man. There is a solution to every core and mold coating and core oil problem in a THIEM product — all laboratory controlled and tailor-made for you!

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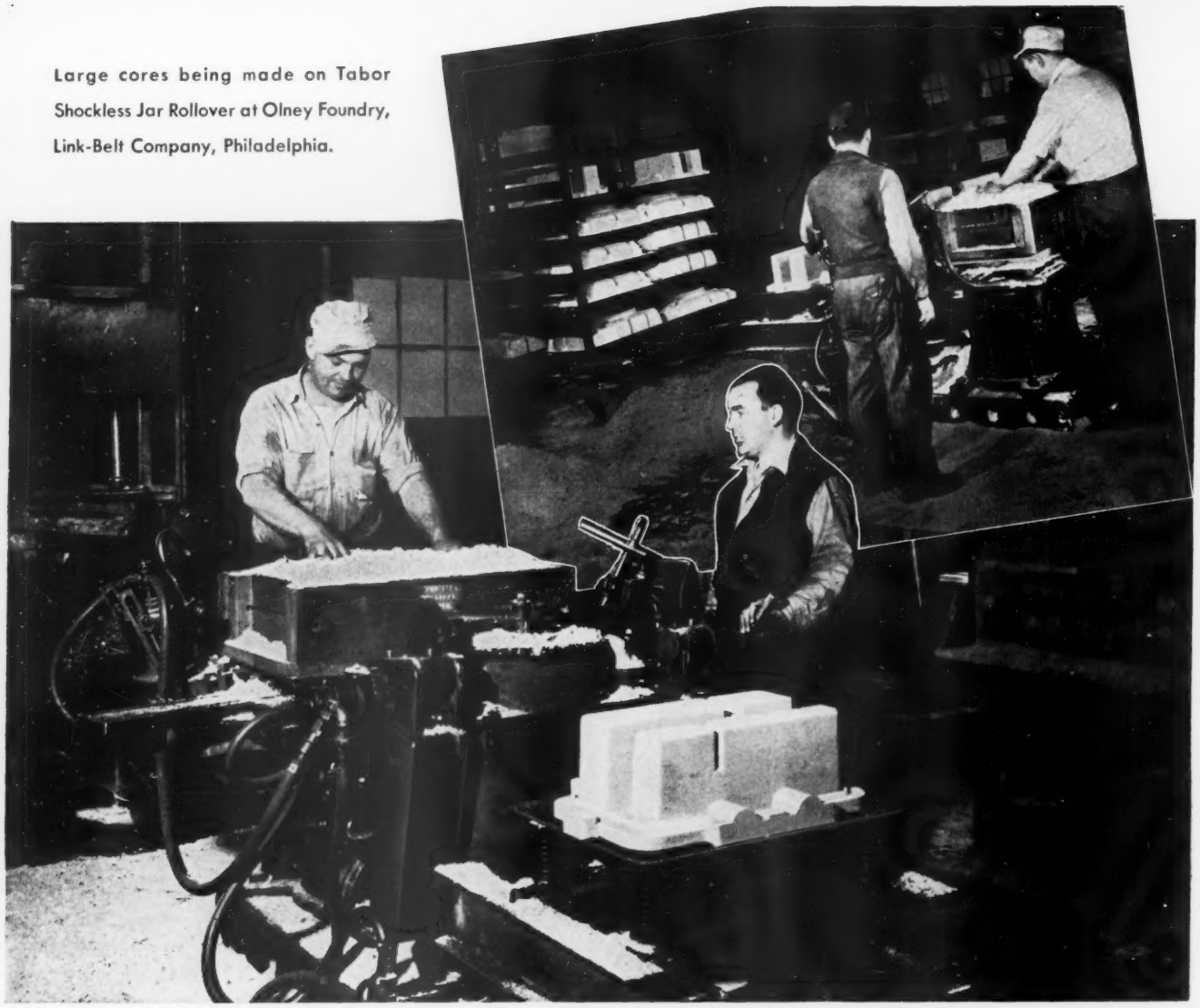
Large cores being made on Tabor Shockless Jar Rollover at Olney Foundry, Link-Belt Company, Philadelphia.



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These National Cast Cooling Sections

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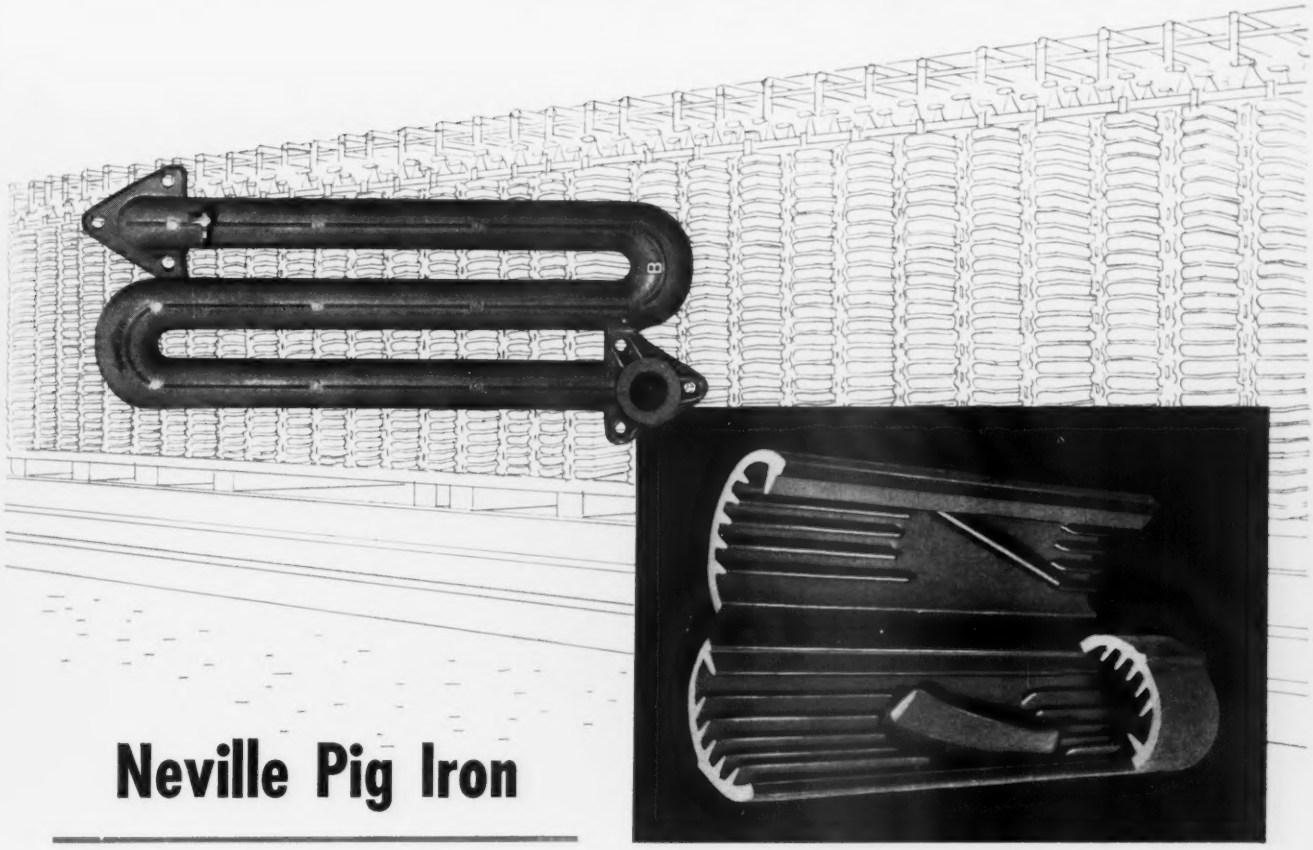
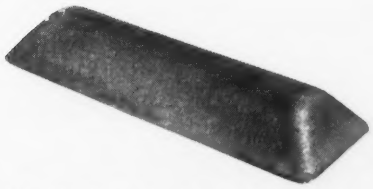


Neville Pig Iron

provides the uniform quality and close grain they need

CAST cooling and condensing sections made by The National Radiator Company, Johnstown, Pa., face some of the toughest service conditions in industry. In chemical plants, petroleum refineries and similar plants, the sections are in constant contact with corrosive materials such as salt water and concentrated sulfuric acid. To withstand these conditions National sections must be cast from gray iron of exceptionally high quality and close grain. And to achieve accuracy in the internal fin design shown above, the gray iron must provide excellent fluidity in casting. To meet these rigid requirements, National Radiator specifies Neville Pig Iron for its cast section production.

W&D 4953



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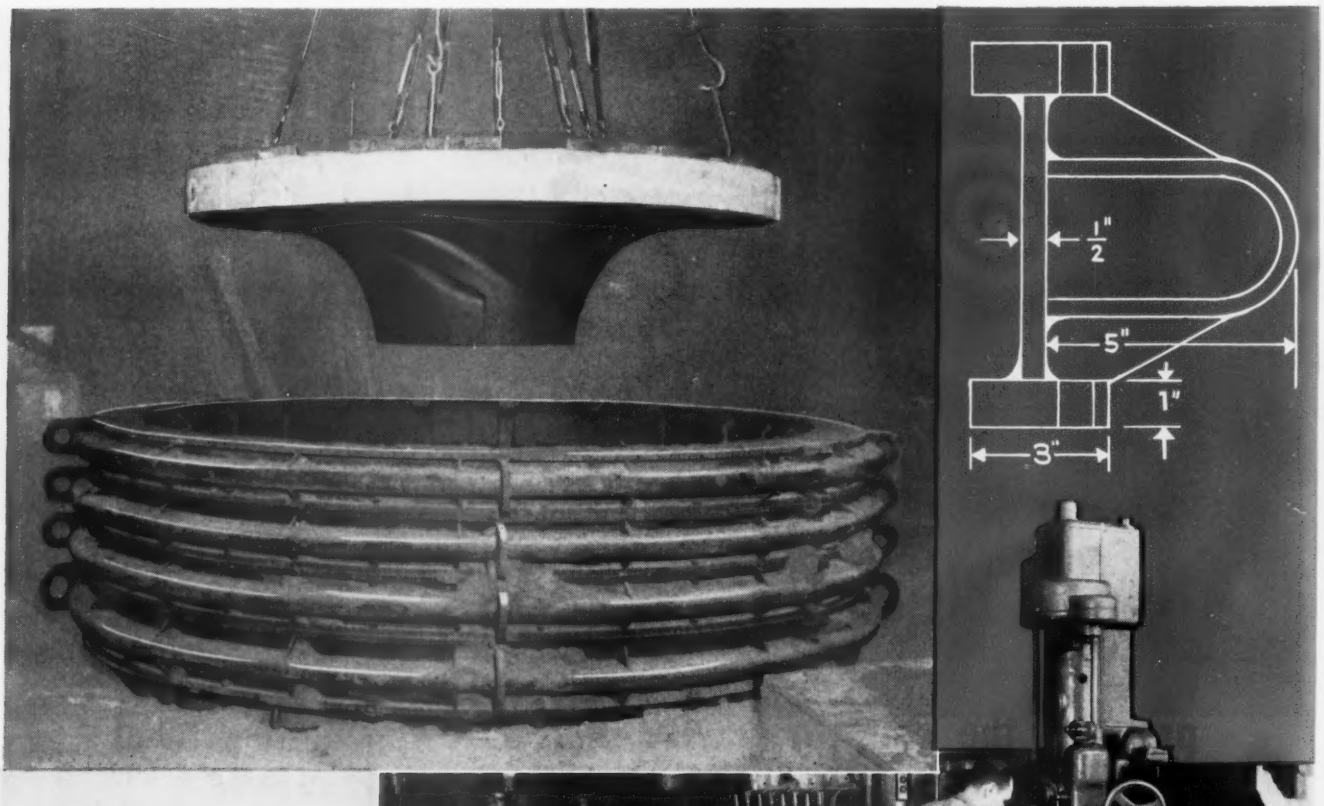
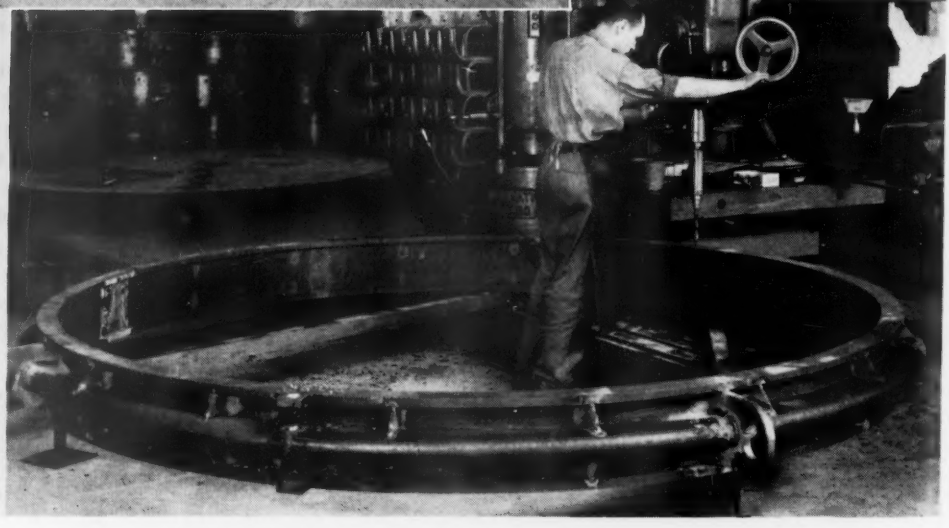
This Unusual Steel Flask

is doing an excellent job for Crown Non-Ferrous Foundry of Chester, Pa.

They pour a 10,000 pound impeller casting in the four section Shanafelt flask which measures 13 feet outside diameter. All the sections are shallow—one 8" deep—which means that no ordinary flask sidewall will give the required strength and rigidity. The enlarged cross section shows the Shanafelt sidewall which met the problem successfully.



The new Shanafelt plant was designed and equipped for only one purpose—making steel flasks. If you have a flask problem, we believe we can help you solve it. At least we'll welcome the chance to tackle it with you.



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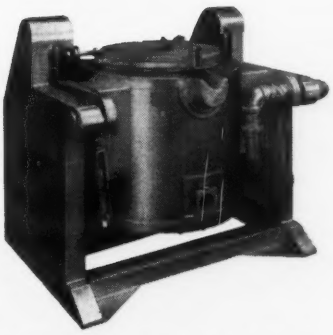

Lindberg-Fisher type MNP nose-pour tilting crucible furnace. Pouring lip is located in the axis of tilting providing a constant pouring arc regardless of degree of furnace tilt. Capacities up to #800 crucible with brass, up to #1000 crucible with aluminum. Oil or gas fired. Described in Bulletin 57-A.

Lindberg-Fisher Electric Resistance Melting and Holding Furnace equipped with heavy duty resistance elements which give uniform distribution of heat, insuring long element and pot life. Capacities 250 to #1000 crucible.

For Non-Ferrous Metals

A complete line of

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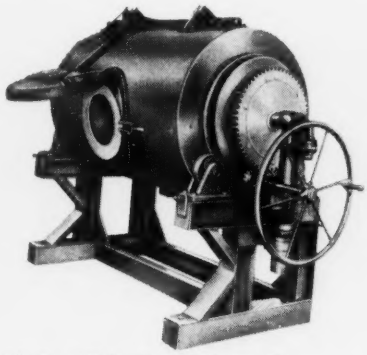
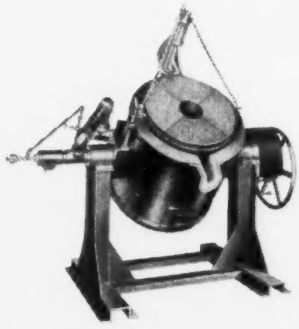
MELTING AND HOLDING FURNACES



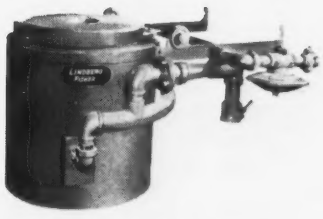
Lindberg-Fisher Simplex Rotary Open-Flame Furnace. Capacities to 2400 lbs. aluminum. 6000 lbs. brass. Oil or gas fired. Described in Bulletin 29-A.

For Melting Aluminum • brass • yellow brass bronze • copper • copper nickel alloys • lead magnesium • nickel • tin • zinc.

Because Lindberg-Fisher builds *all* kinds of melting equipment . . . gas . . . oil . . . electric . . . induction, and Carbon arc . . . L-F engineers are able to recommend, without prejudice, the proper type of furnace for *your* particular melting requirements.



Lindberg-Fisher type BB1 Hand-Tilt Crucible Furnace. Tilting mechanism consists of a hand wheel, driven through machined worm gear and pinion reducing gears. Capacities 50 to #400 crucible. Oil or gas fired. Described in Bulletin 400.



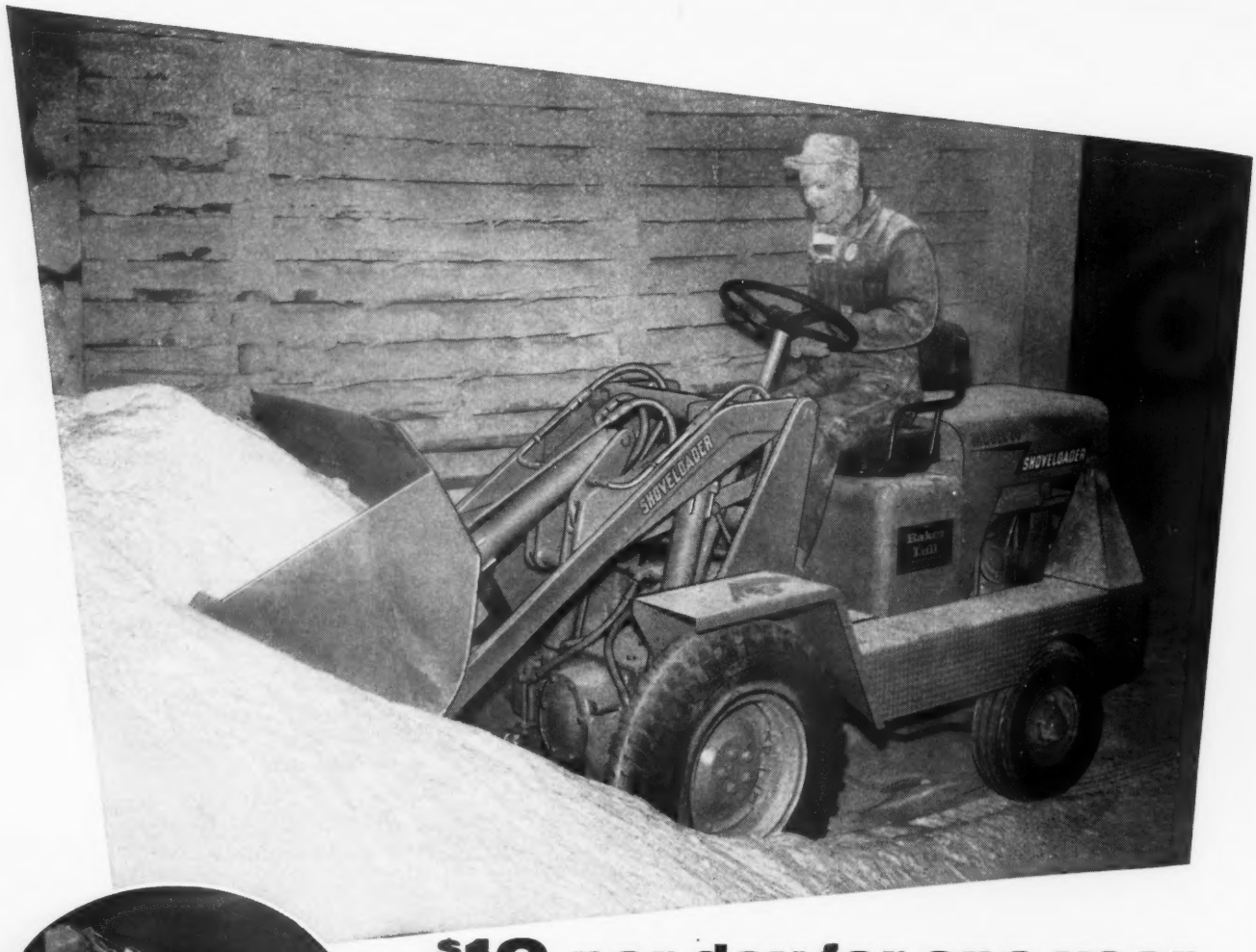
Lindberg-Fisher type SF stationary crucible furnace features rapid melting and is recommended for general foundry casting work. Capacities 30 to #400 crucible. Oil or gas fired. Described in Bulletin 301.

Melting specialists for 25 years

Sales and service offices in principal cities

LINDBERG FISHER **MELTING FURNACES**

A Division of Lindberg Engineering Company, 2453 West Hubbard Street • Chicago 12 • Illinois



$10 per day for one year buys this rugged bulk-handling SHOVELOADER

For only $3395*, less than $10.00 a day for one year... much less than you pay a laborer with a hand shovel... you can own a Baker-Lull 12 cubic foot SHOVELOADER. And you get a lot more for the money!

Check all of these features and see why this SHOVELOADER compares with others costing $350 to $400 more. The lift height is a tall seven feet with lifting capacity a husky 1500 pounds... 500 pounds more than most competitive units. The loader arms are located out in front of the operator—not around him—to keep him safe from injury and give him clear-view visibility at all times. The bucket can be cradled low too, giving him unobstructed forward visibility and making it unnecessary to drive backward as with other units. Maximum travel speed is 14 MPH. Plenty of bucket tilt back at ground level makes it easy to get a full bucket every time from stockpiles... letting you reduce handling costs by moving more bulk in a shorter time.

Attachments let you do more types of work too. Lift forks let you handle palletized loads, the crane hook gives you a portable hoist, and special buckets are available for handling dense materials. Exhaust-destroying catalytic equipment is also available for indoor use where necessary.

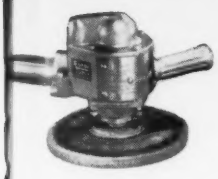
Baker-Lull SHOVELOADERS are available in sizes ranging from 12 cubic feet to 1½ cubic yards four wheel drive. Should you desire information on other sizes please specify when writing. The BAKER-LULL Corporation, 325 West 90th Street, Minneapolis 20, Minn.

*F.O.B. Minneapolis

• *Write for your copy* of Bulletin AD 78A containing full information about the Baker-Lull, Model 20, 12 cubic foot SHOVELOADER which sells for only $3395.00.

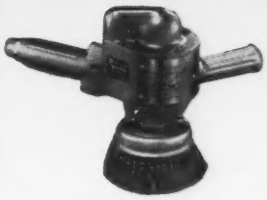
Baker Lull handling equipment

SHOVELOADER



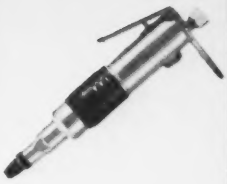
SANDERS

NUT SETTERS



WIRE BRUSHES

GRINDERS



SCREW DRIVERS

SCALING HAMMERS

Try these lightweight . . . speedy

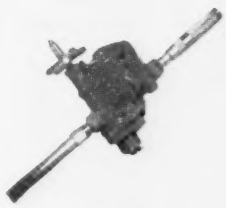
PORTABLE TOOLS

- Produced in the industry's most modern, air-conditioned plant to give you *top precision.*
- Gives you advanced features for *faster production, easier handling.*
- Backed by Rotor Tool's 25-year reputation for applying the *right tool for your job.*

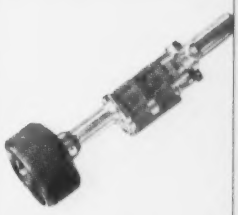
Ask for a free demonstration of any of these tools.

See how they can cut your costs!

SPECIAL BULLETINS ON ALL TOOLS ON REQUEST



DRILLS



BUFFERS

CHIPPERS

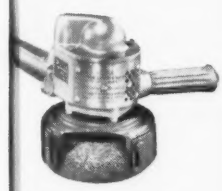
MIDGET DRILLS

SANDING MACHINES

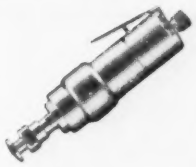
DIE GRINDERS

RAMMERS

ANGLE DRILLS



VERTICALS



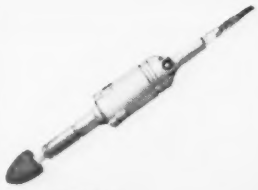
MIDGET GRINDERS

STONE GRINDERS

IMPACT WRENCHES

MIDGET GRINDERS

EXTENSION GRINDERS



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GRINDERS

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HIGH CYCLE

THE ROTOR TOOL CO.

CLEVELAND, OHIO

UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS

DELTA *fast-dri*

LIQUID RESINS AND BINDERS FOR *FASTER PRODUCTION* OF BETTER CORES *at lower cost!*

Cores made with DELTA 155-X and 168-X FAST-DRI Liquid Resins have 1) — an unusually high tensile strength (20% greater than linseed oil), 2) — a lower gas ratio, 3) — a higher degree of elasticity, 4) — less core embrittlement and 5) — greater surface core hardness.

Core sand mixes made with DELTA FAST-DRI Liquid Resins have excellent flowability resulting in denser cores and better workability in core boxes.

The uniformity of DELTA 155-X and 168-X FAST-DRI Liquid Resins is guaranteed. The chemical and physical constants are maintained by strict laboratory control.

OTHER DELTA FOUNDRY PRODUCTS

CORE AND MOLD WASHES:
For all types of sand cast metals: Steel, Gray Iron, Malleable and Non-Ferrous.

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PARTING COMPOUNDS

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MUDDING AND PATCHING COMPOUNDS

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MOLD SURFACE BINDERS – LIQUID

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DRI-BOND
(Dry Binder)

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BONDITE BINDER

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96•B SAND RELEASE AGENT

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CORE ROD DIP OIL NO. 224X

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SAND CONDITIONING OIL

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CORE OILS

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DELTA-DIETERT PROCESS BINDER 103XX
For deep process shell cores.

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DELTA

Working samples for test purposes together with complete data are available to you. Included, also, will be information on other Delta Core Oils, Delta Dri-Bond and Delta Bondite. Your request will receive immediate attention.

DELTA OIL PRODUCTS CO.

MANUFACTURERS OF SCIENTIFICALLY CONTROLLED FOUNDRY PRODUCTS

MILWAUKEE 9, WISCONSIN

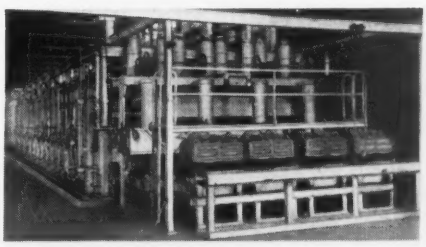
How to Select the Most Economical Insulating Firebrick

The advantages of lightweight insulating firebrick over ordinary "heavyweight" firebrick are generally known to furnace operators and furnace builders. But many buyers have wondered just what advantages there might be in one brand of insulating firebrick as against another. The answer to this question could very well mean savings in fuel costs, increased furnace output, longer life . . . or all three.

One furnace builder ran tests on their small electric kilns where heat input could be measured with great accuracy. Here's what they found: B&W IFB required 25% less heat than any other brand of insulating firebrick they tried.

The reason? B&W IFB are lighter in weight than any other insulating firebrick — they contain more tiny, insulating air cells. Heavier, denser insulating firebrick linings waste fuel two ways: They soak up and store more heat which is lost when the furnace is cooled; and they conduct more heat through the walls.

How about long life? One of the

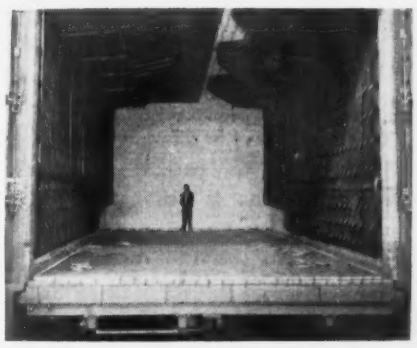


toughest tests of firebrick is in the lining of a carbon monoxide furnace. Some brands last only a few weeks, then disintegrate, due to iron oxide impurities in the brick which react with the gas.

But B&W Insulating Firebrick contain little iron oxide, and they're processed at high temperatures so that any traces of iron oxide form stable compounds. So instead of deteriorating they stay on the job year after year —in many cases over 10 years.

Another factor, important to many furnace operators, is accurate temperature control. Here again B&W IFB have an advantage over other insulating firebrick. First, because B&W IFB are lighter in weight they store and conduct less heat—and they respond more quickly to changes in heat input.

A typical example is the giant stress-relieving furnace shown below—sixty feet by twenty-two feet by seventeen feet high. The B&W lining plays a vital part in holding the desired temperature within 5 degrees accuracy!



Next time you buy or specify insulating firebrick, remember that the lightest weight brick of all—B&W—has the highest insulation value, the longest life and the greatest furnace heat controllability.

THE BABCOCK & WILCOX CO.
Refractories Division
General Offices:
161 East 42nd St., New York 17, N. Y.
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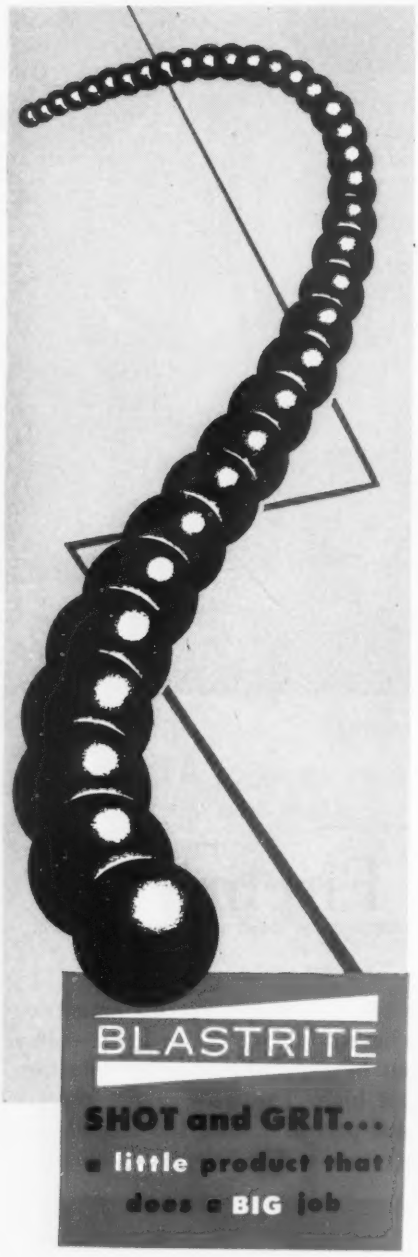
(Advertisement)

R-910



For high quality, longer wear, greater economy, specify Blastrite for your abrasive requirements. It comes in a complete range of standard sizes or in special, made-to-order sizes if needed for your particular operation.

Our new catalog No. AB-53 will give you further details.

ABRASIVE SHOT & GRIT CO., INC.
SPRINGVILLE, N. Y.
Telephone Springville 1

READERS' COMMENT

Floating Foundries

TO THE EDITORS:

I would like to congratulate you and thank you for the article, "Floating Foundries," in your August issue of FOUNDRY.

My father, who operates a nonferrous foundry in Lima, O., (Corrello Foundry & Engineering Co.) sent the issue to me.

From February until July of this year this ship was operating with the Sixth Fleet in the Mediterranean Sea. At that time, we were the sole source of repair to some 70 ships of your Navy. One time we even had an emergency job on an American merchant ship. She was loaded with a cargo of perishable fruit and her conveyor system had broken down.

Few people realize that there is such a thing as a "floating foundry." Thanks again for the article. I am sure it was of great interest to all who read it.

C. E. CORRELLO

USS Tidewater, AD 31
c/o FPO, Norfolk, Va.

* * *

The Patternmaker

TO THE EDITORS:

In the mechanical trades, no craft is less understood than the wood patternmaker. This fact is due in some respects to patterns not being a finished product, but simply tools for the molder in the foundry. Even machinists who have not been around a foundry often have a hazy idea as to where castings come from.

Unlike almost all other crafts, the patternmaker has not been displaced by machinery. On the contrary, the great advance in machinery of all kinds has caused a greater demand than ever for patternmakers.

In the foundry machines operated by semiskilled workers have absorbed much of the work. By the same token, in the construction industry much fine joinery is now done by machine—also frame carpenter work. But no machine can look at a blueprint and create from a pile of lumber a pattern, intricate or otherwise.

Pattern work varies from small jobs you can put in your pocket to patterns 30 or more feet long, consuming several thousand board feet of lumber, often with coreboxes inside of which several men can work. The job pattern shop nowadays accounts for around 50 per cent of all patterns made.

The auto and aircraft industries, and now the atomic age, have added much to the intricate nature of patternmaking. Metal patternmaking, an offshoot of wood patternmaking, is largely used in production work. In a typical pattern shop engaged in automobile work, out of 100 patternmakers around 60 per cent may be metal patternmakers. Wood patternmakers with a knowledge of machine work can generally fill the bill as metal men. Only the industries referred to above use such a percentage of metal patternmakers.

High schools and trade schools all over the country are teaching patternmaking under the caption Industrial Art. However, I think most people capable of giving an opinion would vote for a regular five-year apprenticeship to turn out a craftsman. A job shop, provided it is close to a foundry so that the apprentice can observe foundry work, probably is the better place to learn the trade.

Patternmaking is so closely allied with foundry work that the old system, still in vogue in some places, of having apprentice patternmakers before beginning spend from six months to one year in a foundry, has a great deal of merit. Then, too, if a few months in a machine shop during apprenticeship can be wedged in, and perhaps a spell in a drawing office, that seems the ideal background. Many who have that training can go out as either patternmakers or draftsmen. The writer knows several chief draftsmen in leading plants with such a background.

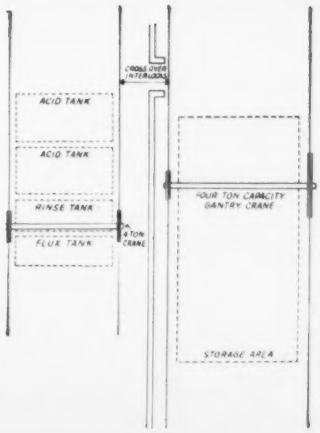
Need Foundry Experience

Patternmakers without foundry experience and not under supervision of a capable foreman are often up against a stone wall if called upon to make a pattern of unusual run. I have seen two men work several weeks on a set of skeleton patterns which, when sent to a distant foundry, were never used; a set of sweeps and guides which were made by foundry patternmakers took their place.

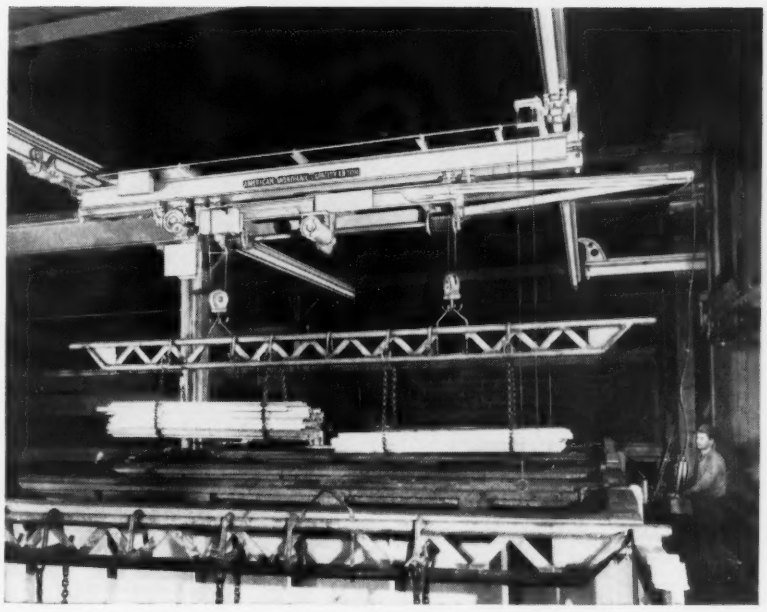
Patternmakers are usually first-class woodworkers, and many of them drift into other lines of woodwork, such as antique furniture repairs, modern custom furniture making, fancy wood turning and wood carving, violin making, and industrial art teaching in high schools and colleges.

The usual woodworking machines are found in modern pattern shops. In the last decade a pattern miller has been put on the market which can do a variety of jobs such as

(*Concluded on page* 100)



AMERICAN MONORAIL GANTRY CRANE SYSTEM *speeds galvanizing!*



Steel fence posts travel from fabrication to galvanizing over a gantry bridge which interlocks at a crossover track through doorway for passage to the MonoRail crane serving the tanks in the plating room.

All travel on the 4-ton system is motor operated and controlled by push-button station in the operator's hand.

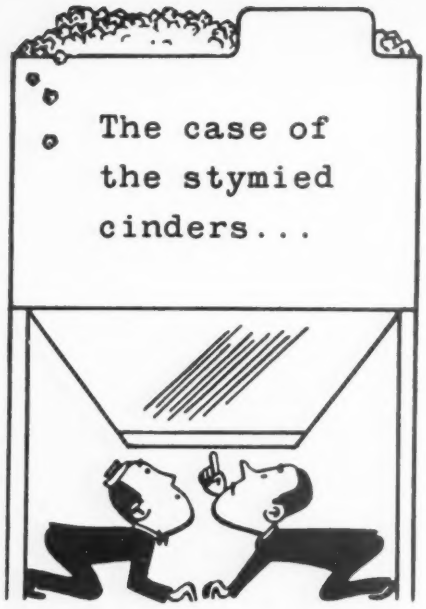
Here is truly team-work handling that results in cost savings as well as increased tonnage through the galvanizing process. It is a typical example of American MonoRail engineering available at no obligation for the solution of your handling problems.

Send for Bulletin C-1 illustrating hundreds of successful Mono-Rail installations.

AMERICAN OVERHEAD HANDLING EQUIPMENT

MONORAIL COMPANY

13104 ATHENS AVENUE • CLEVELAND 7, OHIO



In a Cincinnati outfit handling cinders by the hundreds of tons, production reached a deadlock. Arching and bridging stymied the cinders in their normal course through the bins.

But once again a CLEVELAND vibrator on the sloping side of the bins put an end to costly bottlenecks and equipment downtime.

*Tell us about **your** particular stymie, or ask for our detailed literature. We're sure there's a CLEVELAND to fit your requirements.*

AIR *and* ELECTRIC

2788 Clinton Avenue • Cleveland 13, Ohio

(*Concluded from page 98*)

shaping coreboxes in much less time than by hand. However, so far it is too expensive unless for very large shops, and in particular those shops doing a variety of heavy work such as is done in Naval yards, etc.

As a separate craft, patternmaking is one of the youngest trades, a little over a hundred years old. Before that time patterns were generally made by the millwrights and other woodworkers.

Who made the first pattern we do not know. Some one must have made the patterns for the great columns of King Solomon's Temple. And at San Miguel Mission in Santa Fe, N. Mex., there is a three-quarter ton bronze bell cast in 1356.

As a reader of FOUNDRY since the first issue, I have enjoyed the well written articles on patternmaking, especially in the first twenty-five or thirty years of your publication.

PAUL LAWLER

1435 *Imperial*
San Diego, Calif.

* * *

They Use Castings

TO THE EDITORS:

On page 10 and 12 of the July issue of FOUNDRY, you printed a letter quoting a report on the Cleveland Foundry Show criticizing the manufacturers of foundry equipment for their "liberal use of weldments and fabrications and minimum use of castings in machines being exhibited."

We would like to call to your attention that on each of the Shalco shell molding machines exhibited at the Foundry Show there were 21 shell molded castings substituting for weldments, flame cut, machined or sand cast parts previously used. In each case the savings realized were substantial, ranging from 20 per cent to more than 80 per cent. In some cases our pattern costs were fully covered on the first dozen shells poured. Savings as high as $25 per mold poured have been realized. Moreover, the shell cast parts were in every case improved, both functionally and in appearance.

This experience has proved conclusively to us that the precision, finish and other direct economies of shell molding do pay off and in a "big way," even on relatively short-run production. Approximately a dozen additional parts of the Shalco machine are currently under study for conversion to shell molding.

We are enclosing photographs showing some of the parts currently being shell molded.

FRANK K. SHALLENBERGER
President

Shalco Engineering Corp.
81 *Encina Ave.,*
Palo Alto, Calif.

Machine parts cast in shell molds. Fig. 1—Ejector wheels at lower left were machined from bar stock at finished cost of $2.38. Shell molded ejector and oven wheels at right cost 54 and 71 cents. Above are shown the shell mold and the wheels as cast. Fig. 2—Front and rear bearing housings. Weldments at left used originally cost $8.58 each. Shell molded housings at right cost $1.76 and $1.43 each. Fig. 3—Automatic clamps, when flame cut (left), drilled and the mating parts assembled, cost $1.34. Shell molded clamps at right cost 82 cents. Fig. 4—Various shell molded parts used on Shalco shell molding machine at saving of $43.37 per unit

NOW...

The CONVENIENCE of 1

SOURCE OF SUPPLY *PLUS*

The DEPENDABILITY of 4

SOURCES OF SUPPLY

for ALL your foundry coke

There's a plant near you—

Semet-Solvay Division is the only merchant coke producer with four coke plants. And they are so strategically located that they can serve more than 82 per cent of the gray iron foundries in the United States and Canada. This means that one or more of our plants can conveniently serve you. Each is ready to supply all the high-quality foundry coke you need... when you need it! Yes, your coke supply is assured when you specify Semet-Solvay for...

Semet's new capacity is a record 3,750,000 tons per year!

Thanks to a new battery of 76 coke ovens at our Ashland, Kentucky, plant, Semet-Solvay goes even further out front as the largest producer of merchant coke in the country ...3¾ million tons per year! And, because Semet has no prior commitments with affiliated steel plants or public utilities, our foundry coke customers have first call on our output. You get the *kind* of coke you want when you specify Semet-Solvay because...

Your coke is sized to fit your cupola

You have your choice of 5 sizes when you "go Semet," for each of Semet-Solvay's four plants has the latest machinery for screening, for daily physical tests and chemical analyses. Our fifty years' experience in coke making and our complete control over all phases of coke production from mine to cupola mean that Semet-Solvay can assure you of properly sized foundry coke that is dependable in supply and consistent in quality. That is why *Semet-Solvay* foundry coke means "Better Melting."

Another Semet "plus"
FREE Metallurgical service

To give the specialized "outside" aid that often clears up trouble or variable results in a foundry, Semet-Solvay has available Foundry Metallurgists—practical foundrymen who are not only experts in the use of Semet-Solvay foundry coke in the cupola, but are qualified consultants in many phases of gray iron foundry operations.

Let them help you. There's no charge or obligation.

SEMET-SOLVAY DIVISION

Allied Chemical & Dye Corporation

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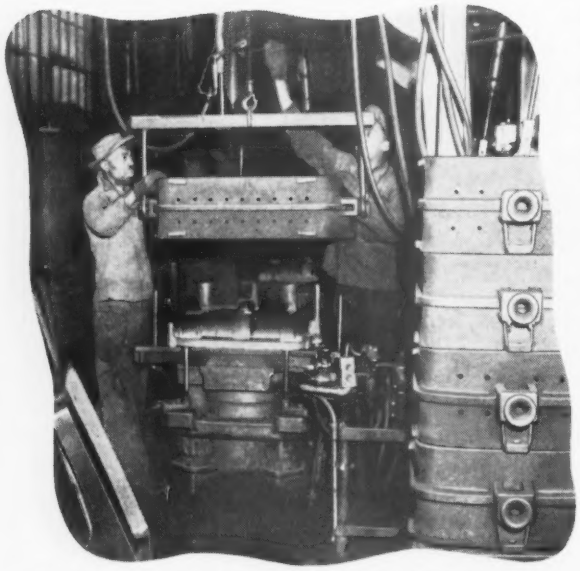
Cincinnati—723 Dixie Terminal Building, Cincinnati 2, Ohio **Cleveland**—2405 Terminal Tower Building, Cleveland 13, Ohio
Detroit—2532 Buhl Building, Detroit 26, Michigan **Buffalo**—602 Genesee Building, Buffalo 2, N. Y.
Toronto—25 King Street, Room 1317, Toronto 1, Ontario, Canada
Western Agent—Wilson & Geo. Meyer & Co., 333 Montgomery St., San Francisco, Calif.

THAT'S WHAT Sterling FOUNDRY FLASKS ARE MADE OF...

ROLLED STEEL

Not Pressed Steel

...and that's why they stand the gaff of tough foundry use



Sterling Rolled Steel Flasks in use at a well-managed Mid-West foundry.

Tensile strength of 70,000 p.s.i. adds *years* to the life of Sterling Foundry Flasks. Special hot-rolled steel channel with controlled content of copper bearing and carbon assures maximum strength. Sterling Flasks are all-steel welded into one solid, rigid piece... with center-rib rolled into each section to fortify against torsional and other strains. Square cornered sand-flanges, full width bearings, partings accurately *machined* to .005" precision . . . these and other life-prolonging features help you make better castings, at better profit, with Sterling Rolled Steel Flasks.

FASTER MOLDING... EASIER SHAKEOUT

Even top-speed molding leaves no soft spot under the patented Sterling Sand-flange. Fillets eliminate sharp corners at top and bottom of both cope and drag. Flange won't curl under jolt action. Investigate light weight and super strength of Sterling Rolled Steel Foundry Flasks.

Write for Catalog!

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FOR NEARLY HALF A CENTURY *manufacturers of* FOUNDRY EQUIPMENT

A 8026-1PC

Emphasizing Quality

The steel foundry industry recently took an important step which may influence greatly the development of an increased demand for steel castings. After considerable study and deliberation the Steel Founders' Society of America has adopted a recommended minimum standard for commercial steel castings. The action is part of a well developed and aggressive society program to sell more steel castings by producing a better product and doing an intelligent job of merchandising.

The new minimum standard will have no bearing on the many steel castings being sold on existing specifications, such as ASTM, SAE, AAR, federal, military and others. But it does provide a basis of expectancy between customer and foundryman for the sizable tonnage of commercial steel castings for which specifications are not indicated. For the first time in the history of steel castings, the customer knows what the steel foundry industry considers as the minimum standard of quality.

While acceptance of the recommended minimum standard is voluntary on the part of both buyer and seller, there appears to be little doubt that the customer will be keenly interested in utilizing this basis of mutual understanding. With the promotion efforts of the society and the co-operation of the industry, this new standard should find wide acceptance.

Several interesting developments may be expected. First, the emphasis on quality, dependability and reliability should provide a good selling tool for steel foundrymen. Pounding home these facts is an important function of the society as well as each individual company selling steel castings.

Second, the steel foundry industry will need to pay more attention to quality control. The standards are sufficiently high to require production know-how and proper controls if they are to be met.

And third, the step taken by the Steel Founders' Society of America may influence all other segments of the foundry industry. Many customers of steel foundries are buyers of other types of castings. If the recommended minimum standards for steel castings prove of value to the customer, he may suggest a similar instrument to producers of both ferrous and nonferrous castings.

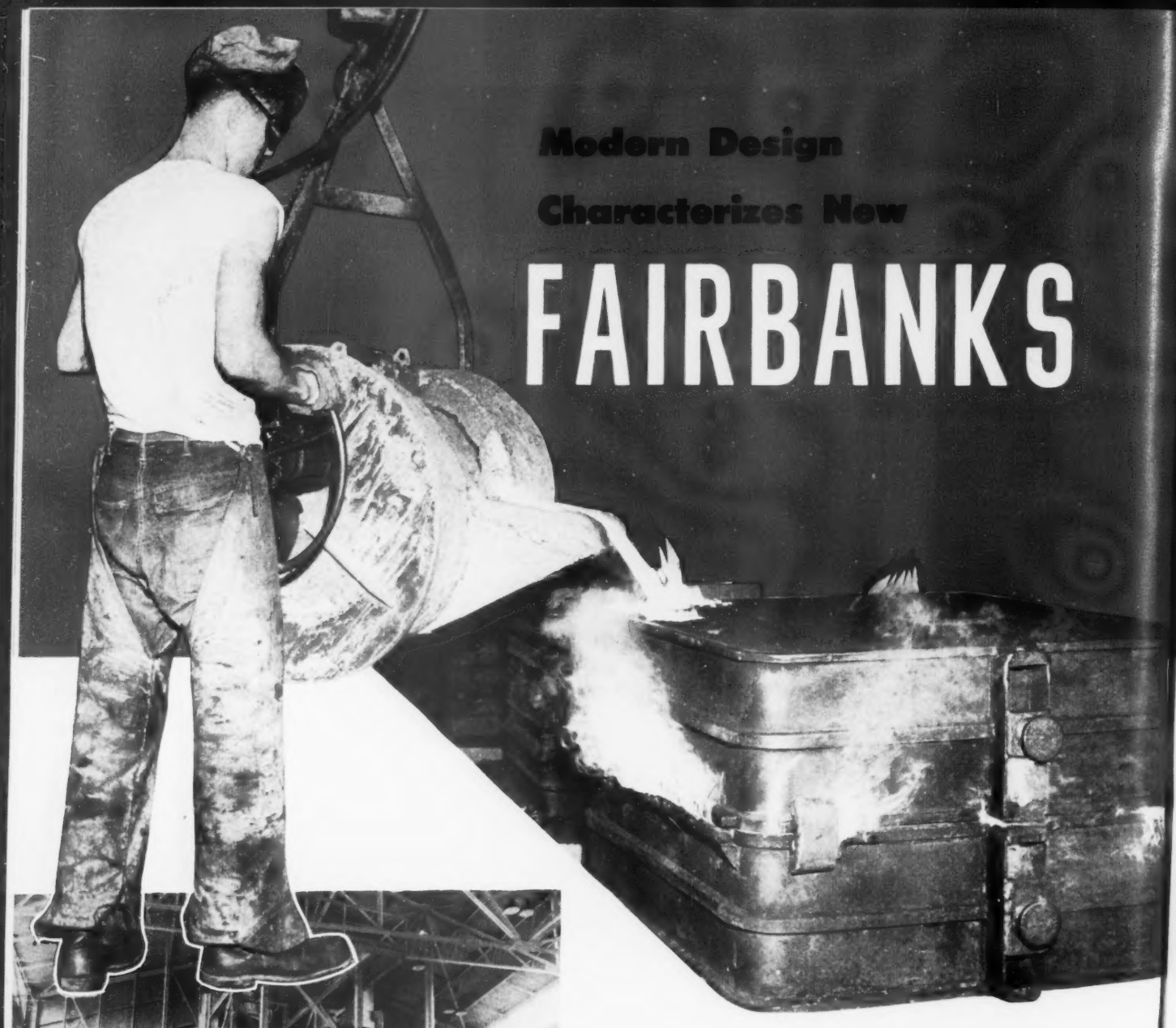
In serving the best interests of the steel foundry industry, the SFSA probably has helped the entire foundry industry, because greater attention to quality will sell more castings.

Frank G. Steinebach

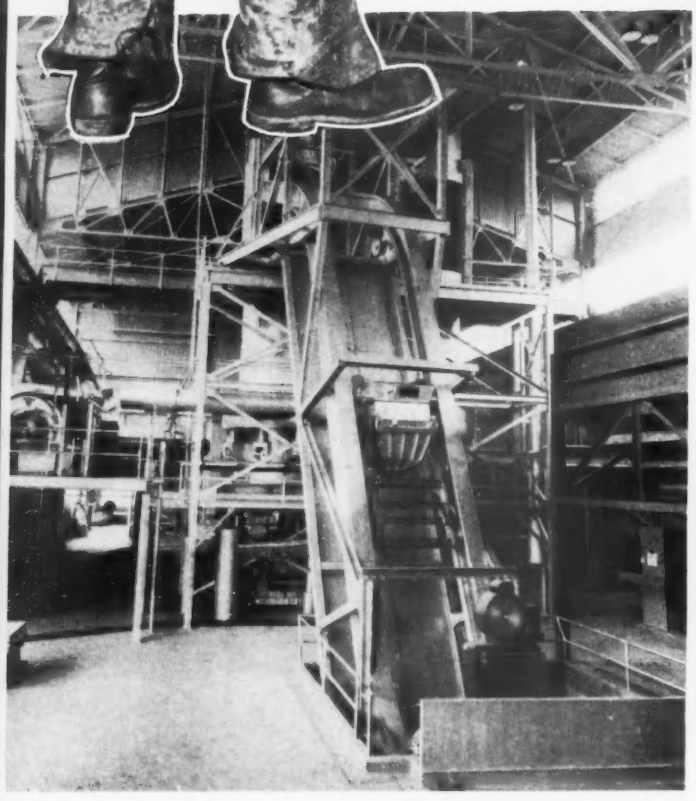
Editor

Modern Design Characterizes New

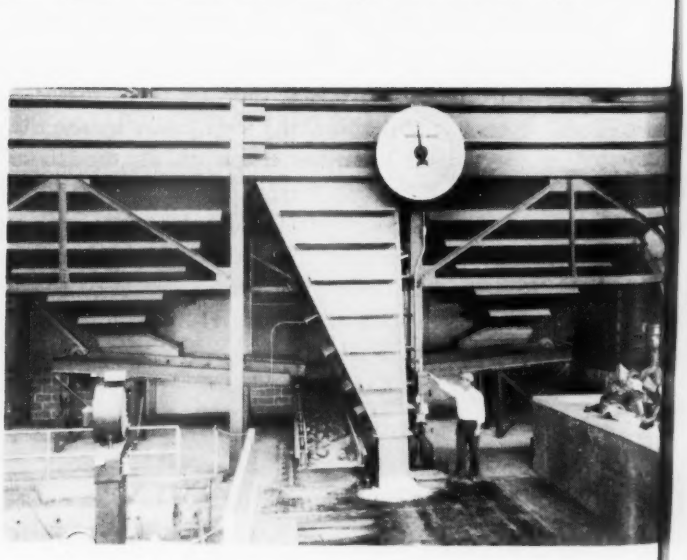
FAIRBANKS



Pouring intermediate size castings on mold conveyor



Skip hoist may be swiveled to charge either of the cupolas. Melting department is entirely enclosed



Cupola charge make-up station. Coke and limestone hoppers in background, metal storage bins at right

MORSE FOUNDRY

Castings in a wide variety of types and sizes are being produced at this new foundry in Kansas City, Kans. Mechanical features of the plant include pneumatic delivery of core sand, a basement room for cooling poured molds, overhead conveying of hot castings, enclosed cupola charging and liberal use of ventilating and exhaust equipment

By WILLIAM G. GUDE
Managing Editor

FAIRBANKS, MORSE & CO. recently completed one of the country's most modern and most efficient foundries. It is unique in several respects because its design was dictated by the castings requirements of the manufacturing plant it serves. And those needs are highly diversified, embracing not only small, medium-size and large gray iron castings, but also brass and stainless steel.

The foundry is an integral part of the company's new pump works located on a 38½-acre site on the outskirts of Kansas City, Kans. Principal products of the plant are various types and sizes of pumps, but single-cylinder gas engines ranging from 2 to 30 horsepower also are being built. The machine shop covers about 180,000 sq ft, while the 290 x 420-ft foundry building has nearly 150,000 sq ft of floor area, including some multistory sections.

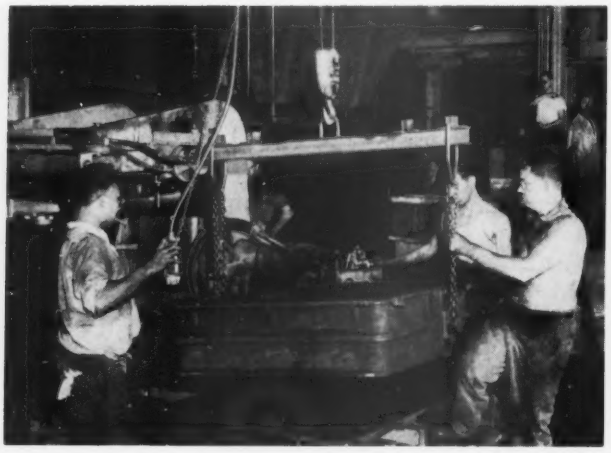
Capacity of the foundry is approximately 60 tons of gray iron, 5 tons of brass and 1 ton of stainless steel castings daily. These figures may be revised as the plant goes through its shakedown period and operating details are ironed out. Sizes of castings to be produced generally range from 15 to 2200 pounds for gray iron, 25 to 520 pounds for brass and 40 to 50 pounds for stainless steel. Capacity is available to produce individual stainless steel castings up to 600-700 pounds.

This plant might be considered as several foundries wrapped into one. For the production of gray iron three separate molding areas—light, intermediate and heavy—are provided, each with its own sand conditioning and distributing system. However, all of the areas are accommodated by central melting and coremaking departments. Brass and stainless steel are cast in a separate section at the northeast corner of the building. This area has its individual sand system, cleaning equipment and coreroom.

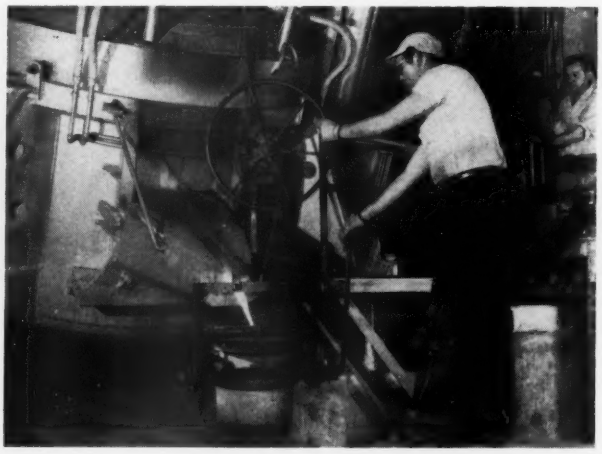
Cupola Operation—Bad weather is of little concern to the cupola crew at this foundry. Cupolas, the charge make-up station and raw material bins all are snugly enclosed in a 60 x 240-ft bay that is roofed over and well illuminated. The area is serviced by two 6-ton traveling cranes. A crane handles the metal charges and also unloads scrap and pig iron from freight cars, which can be moved into the enclosure alongside the various storage bins.

Spectrograph is used in checking metal composition. Complete analysis can be obtained within 20 minutes

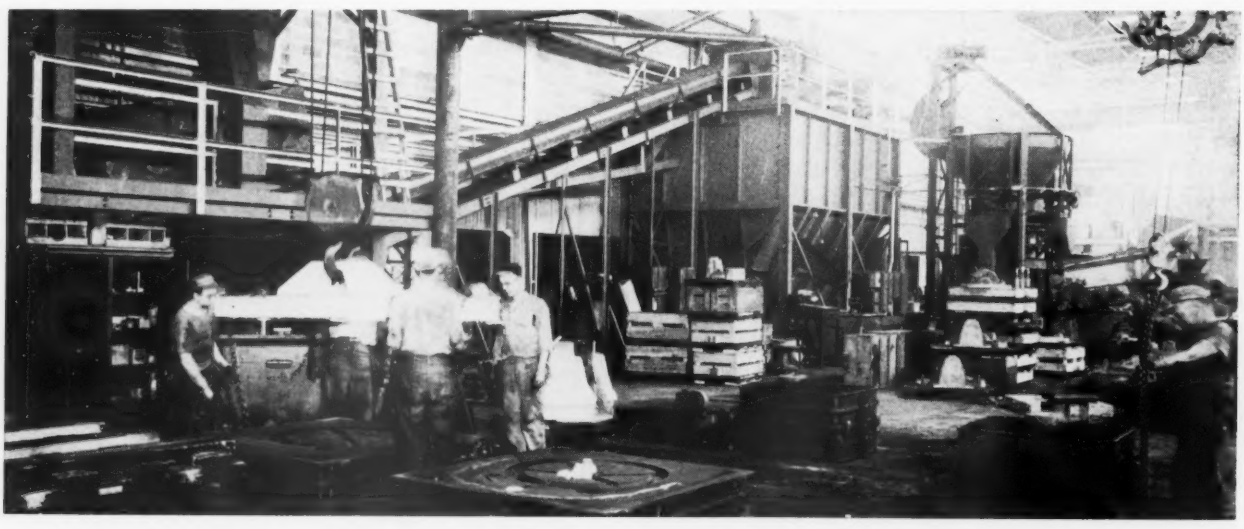
Light molding area has six squeezer machines and three cope and drag pairs. Jacket shifting station on mold conveyor line shown at left



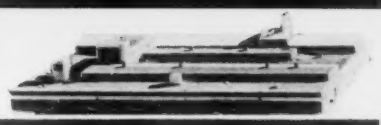
Flasks are rammed by sandslinger in the intermediate molding area and set out by crane onto mold conveyor

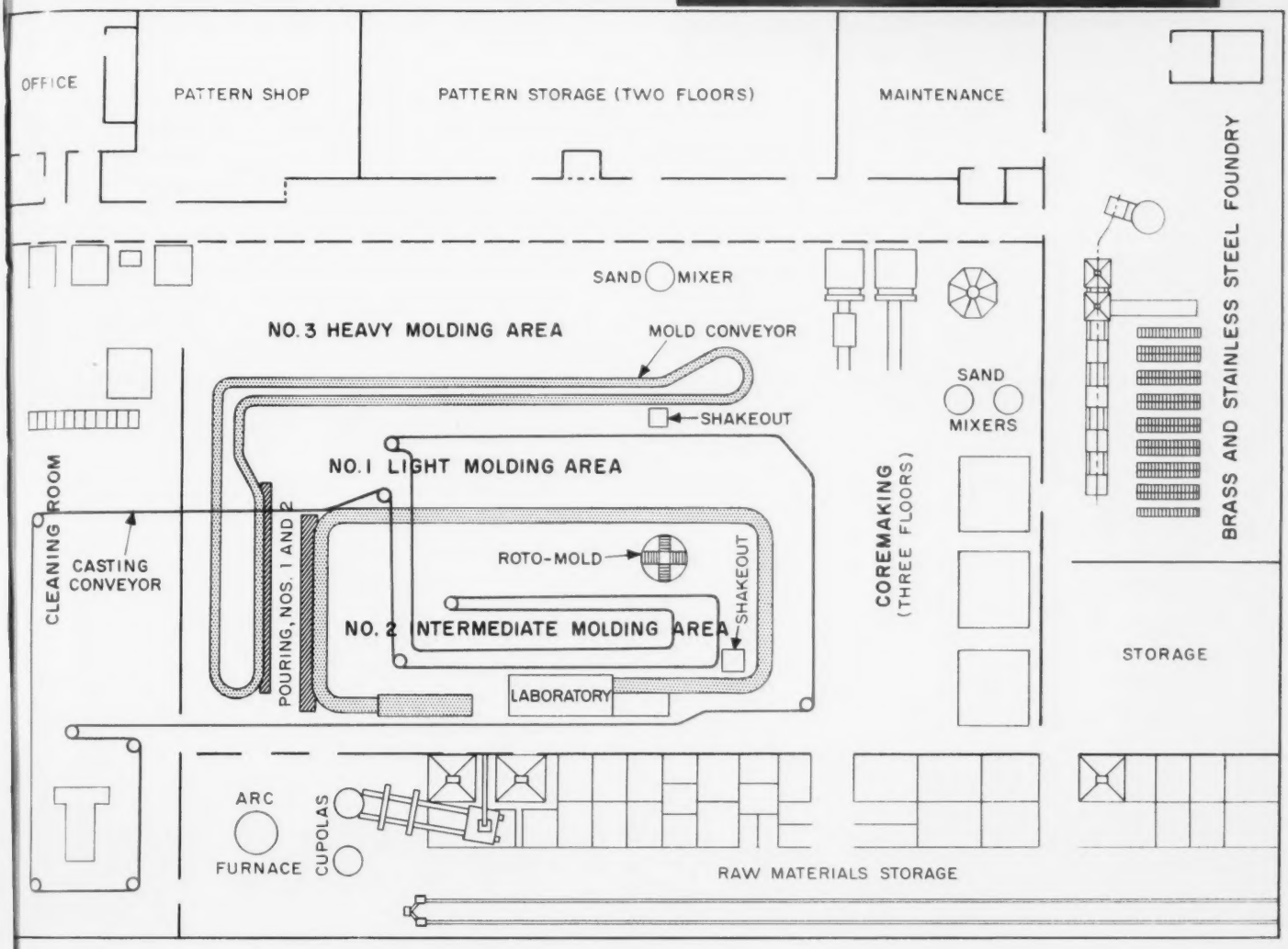


Electric furnace is used primarily as a holding unit for cupola metal. It has holding capacity of 11 tons



View of the heavy molding area for making castings ranging up to more than 1 ton in weight. This department has its individual system for preparing molding sand





Layout of the 290 x 420-ft foundry building showing location of the principal departments. The overhead casting cooling conveyor serves two molding areas

Bins that hold scrap and pig iron are built of concrete slabs fitted in a metal framework. Individual slabs can be easily lifted out and replaced if damaged, without the necessity of rebuilding an entire wall. The storage area also includes six sand bins and four coke bins of conventional concrete type, each of 100 tons capacity, plus other bins for miscellaneous raw materials.

Iron is furnished by two cupolas that are lined to 54 in. and equipped with air-weight control and wet type dust suppressors. Operated on alternate days, the cupolas melt 8 to 12 tons an hour. The units are the front slagging type, and slag is discharged through an under-floor sluice to an outdoor settling basin. The cupola drop at the end of the day's melt is caught by a car that travels over rails to the outside of the building for dumping and quenching.

Entrained material from the cupola dust arrestors also is flushed into the settling basin. This basin has two compartments, permitting one to be cleaned while the other is in service. Water is drawn off for reuse.

The cupolas, located at the end of the raw materials bay, are charged by a skip hoist of 1 ton capacity. Metal charges of 1500 pounds consist of 30 per cent returns, 30 per cent pig iron, 20 per cent steel scrap and 20 per cent iron scrap. Coke and limestone hoppers are located adjacent to the charge make-up station. They are equipped with vibrating feeders that direct the coke and stone to a make-up hopper below the floor.

Two scale dials are used to insure accuracy in weighing charges. One, the main scale dial, is within close view of the operator handling the charge make-up. A larger remote dial connected to the scale is located overhead to guide the crane operator in adding the correct weights of pig and scrap to the charge. The scale makes a printed record of the weights of materials charged.

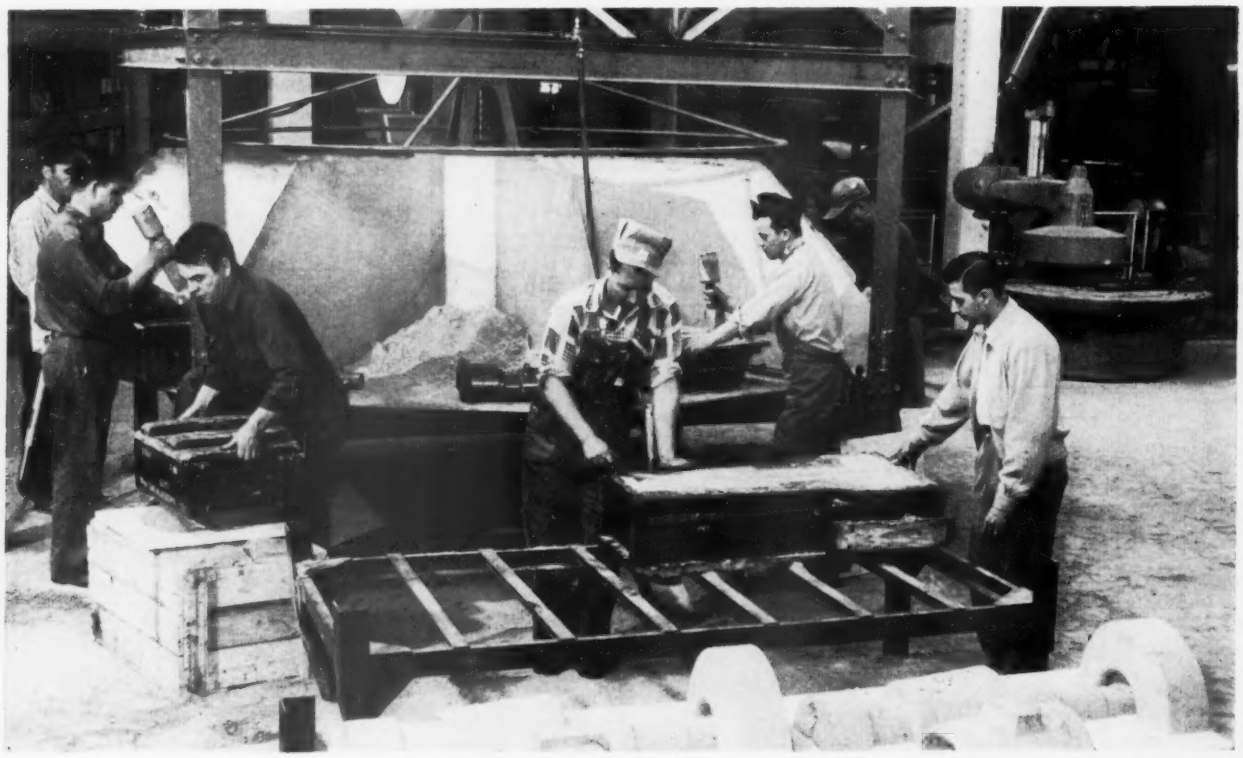
After the required amounts of materials are accumulated in the make-up hopper, the charge is dropped to a cone-bottom charging bucket and delivered to the cupola. The skip hoist is the swivel type and can be positioned to either of the cupolas.

Continuous tapping is employed, the metal generally flowing first into an arc electric furnace having a holding capacity of 11 tons. If desired,

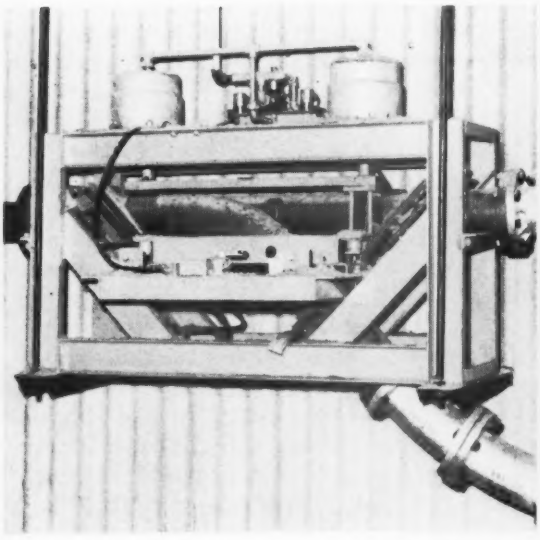
the metal can be tapped directly to ladles for pouring. In addition to its role as a holding unit, the electric furnace can be used in making special analysis irons. It has a melting rate on cold charges of 2 tons per hour. Hot metal is delivered to the pouring lines in 1600-lb-capacity ladles over an electrified monorail. These ladles are used both for pouring larger molds and for transferring metal to 400-lb pouring ladles on the squeezer line.

Coremaking—Molding and core sands are received in freight cars and discharged through a floor grate to a track hopper at the opposite end of the raw materials bay from the cupolas. A conveyor and elevator system transfers the sand to storage bins. Core sand is moved by clamshell bucket as required from the storage bins to 36-ton-capacity hoppers located above a muller. A weigh lorry under the hoppers weighs the sand before it is dumped into the muller, which can prepare 10 tons an hour. Core oil is drawn from a 12,000-gallon-capacity storage tank and is measured accurately as it is added. Prepared core sand is discharged into a receiving hopper, and compressed air blows it through pipes to two coremaking areas.

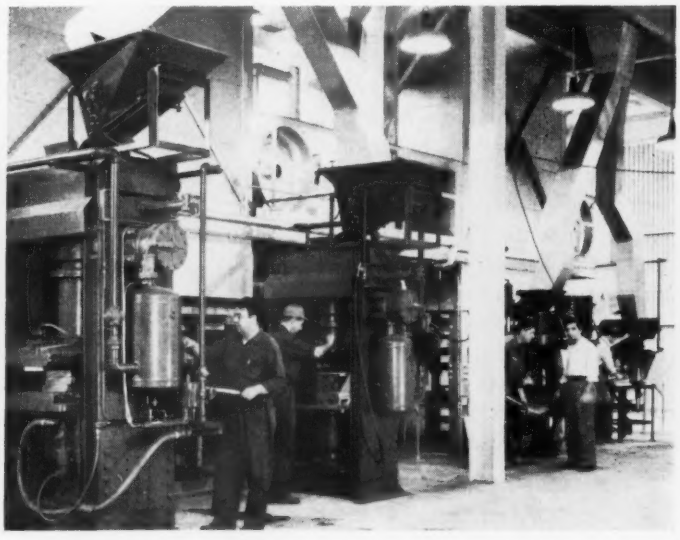
The main coreroom occupies three floors. Smaller cores are made by blowing machines on the



Octagonal table provides benches for coremakers in area where large cores are made. Pneumatic pipe system delivers sand through swiveling spout over table



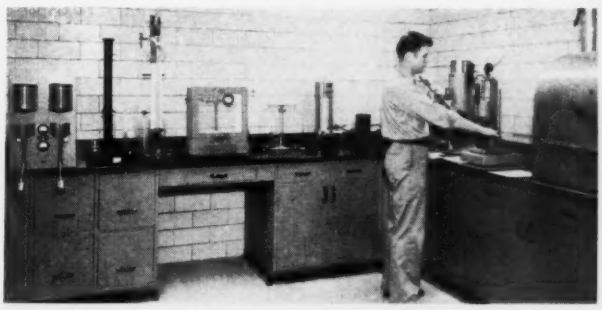
This switch is used to route core sand through the pneumatic pipe system to coremaking areas



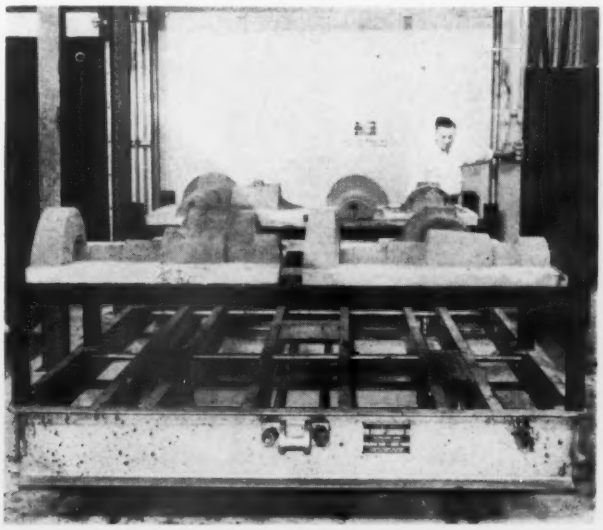
Core blowers are located on the second floor. Cores are loaded on a tower oven here and unloaded on ground floor

second floor, loaded on a tower oven for baking and unloaded on the first floor. Core finishing, pasting and coating are done on the first floor, where an overhead redry oven of the continuous type also is located. The third floor is used for corebox and drier storage and for distribution of sand through gratings to the stations on the floor below.

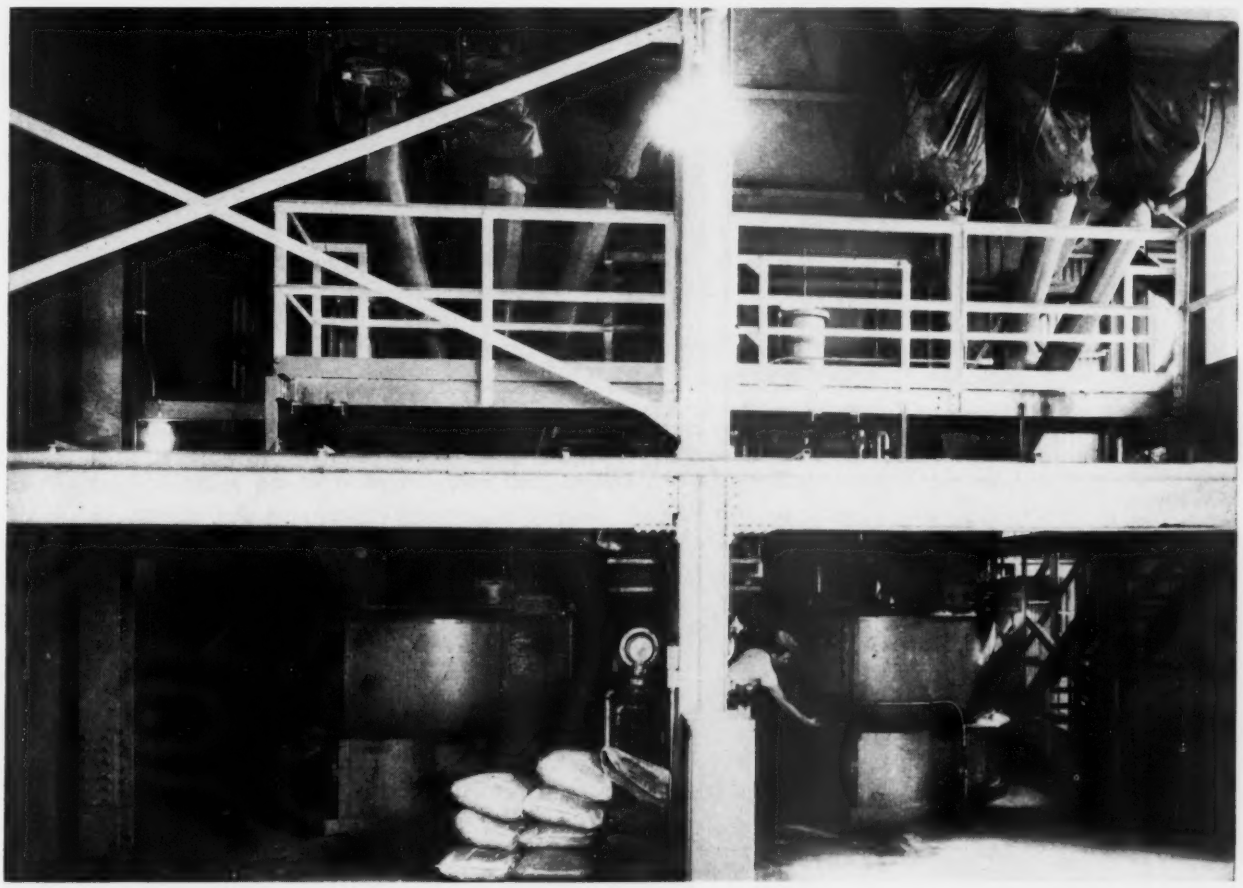
A second coremaking area is devoted to production of larger cores ranging up to 2000 lb. It adjoins the finishing department just described and has a two-compartment baking oven of the car type. Racks on which the green cores are placed can be stacked two or three high on the oven car. An unusual feature of this department is the working arrangement for the coremakers. Instead of the conventional row of benches, an octagonal table divided by partitions into pie-shaped sections is employed. Sand is delivered via pneumatic pipe system and deposited through a spout which can be swiveled to any of the table's eight segments. About 1 lb of core sand is required for each pound



Part of the foundry's well equipped sand laboratory. Properties of sand mixtures are checked frequently

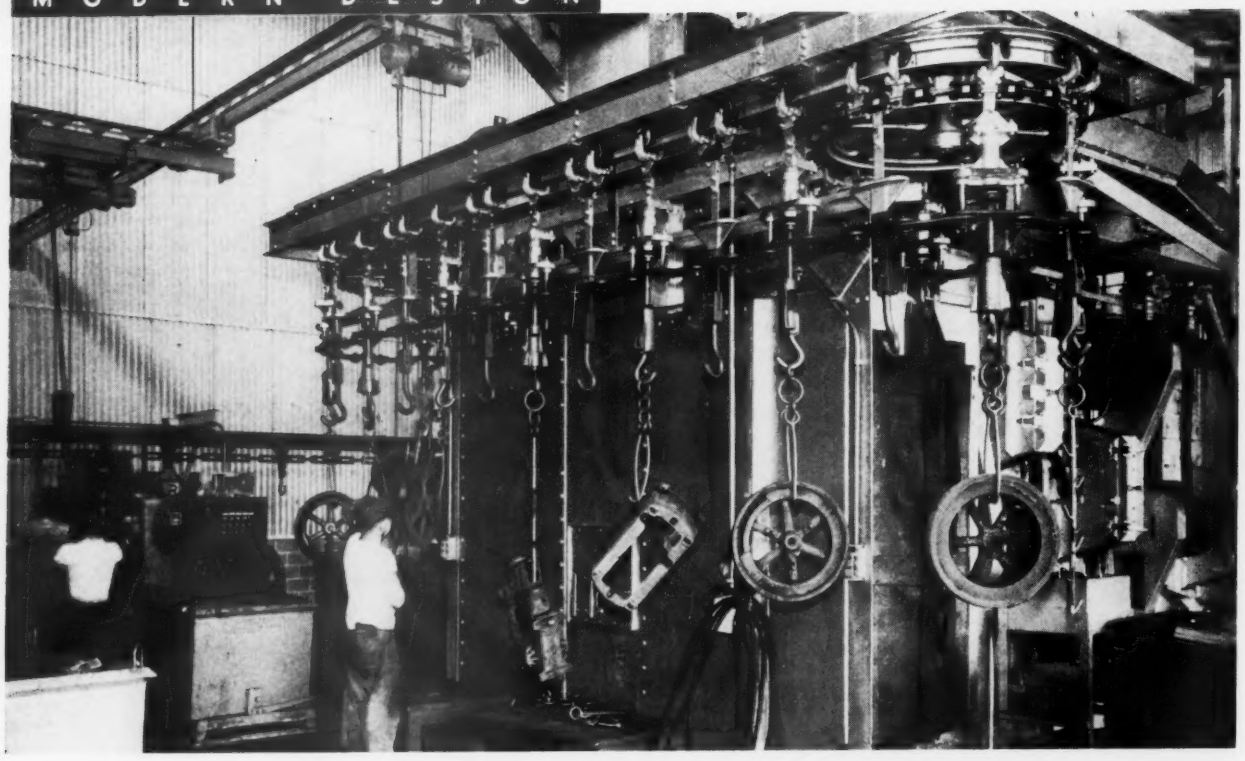


Two-compartment car type oven is used for baking large cores. Racks can be stacked two or three high on car

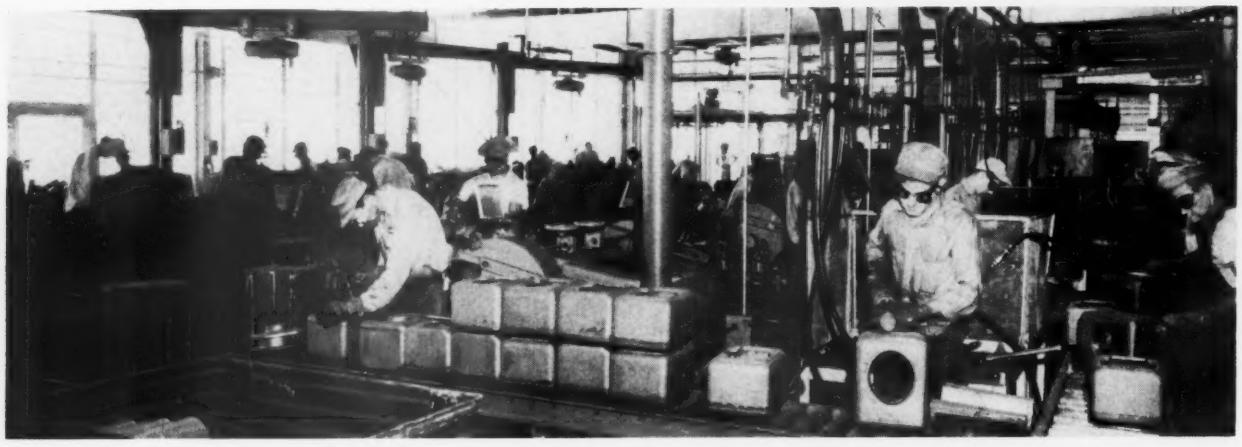


Two mixers for preparing molding sand used in the light and intermediate molding areas are located on the second floor. Bond and moisture are added automatically

MODERN DESIGN



Medium-sized castings are cleaned in this continuous airless shot blast room. Castings are moved to the department by the monorail chain conveyor at left



View in cleaning room where small and intermediate size castings are blasted, chipped and ground. Layout is arranged for straight-line flow of work from unloading of castings at one end to their spray painting at the other

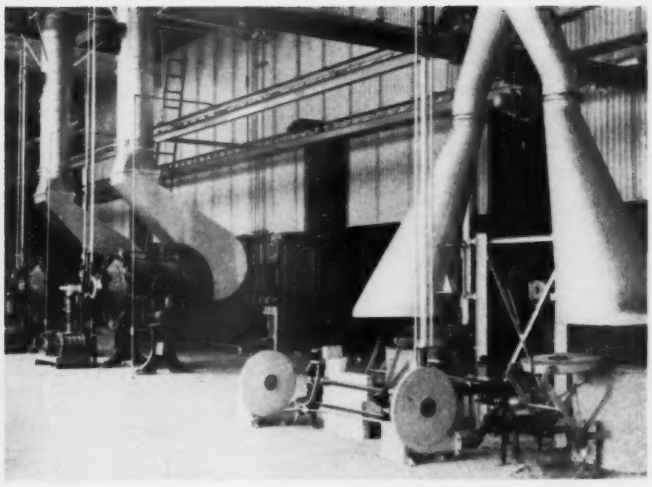
of castings produced. The molding sand ratio is six to one.

Molding Areas—The foundry now has about 3000 active patterns and eventually expects to more than double this figure. However, the large bulk of castings production is from a relatively small percentage of these active patterns. In the interest of efficient operations it was decided to provide individual mechanized lines with mold car conveyors for the light and intermediate work and a separate area where larger flasks are rammed and set out on the floor for pouring.

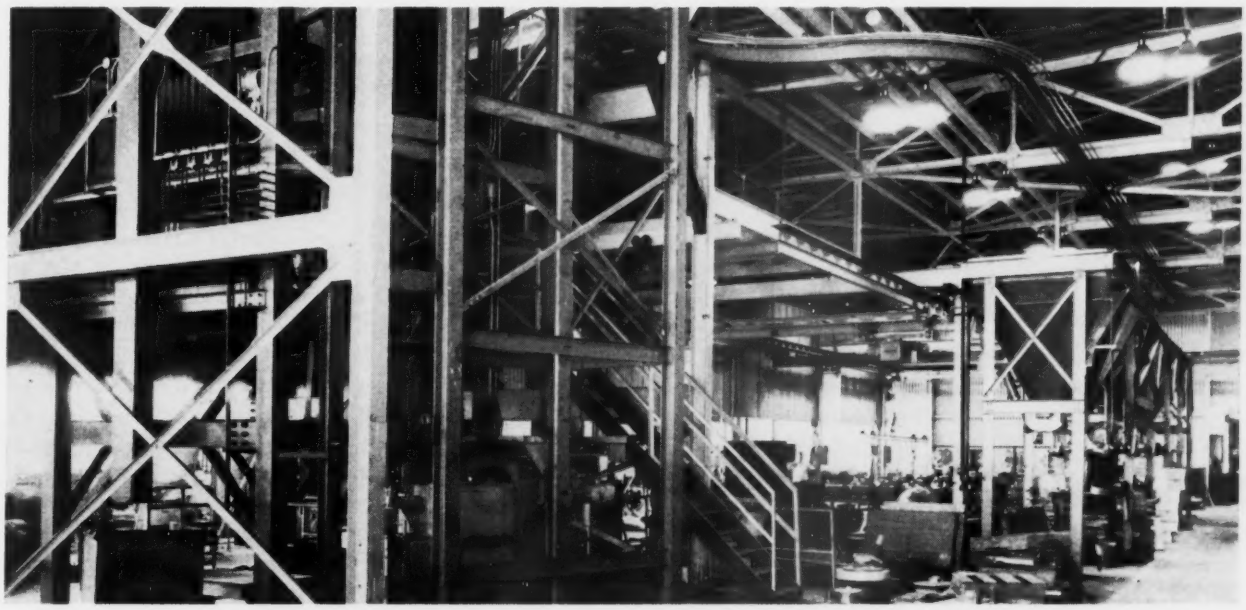
No. 1 line, the light molding area, has six squeezer machines and three pairs of cope and drag units. Production is about 275 molds an hour, with space available for additional molding capacity. Machine operators obtain sand from overhead hoppers, and spill sand drops through a floor grating to be returned by belt conveyor to the system. Molds are made in snap flasks and are jacketed before arriving by car conveyor at the pouring station. Manual handling of mold weights is eliminated by a monorail carrier which automatically lowers a weight onto each mold just before pouring.

Molds are poured from monorail-suspended

A sizable shop is devoted to making and repairing the large number of patterns the foundry requires



Hot metal is provided in the brass foundry by two rotary furnaces, left, and two crucible furnaces



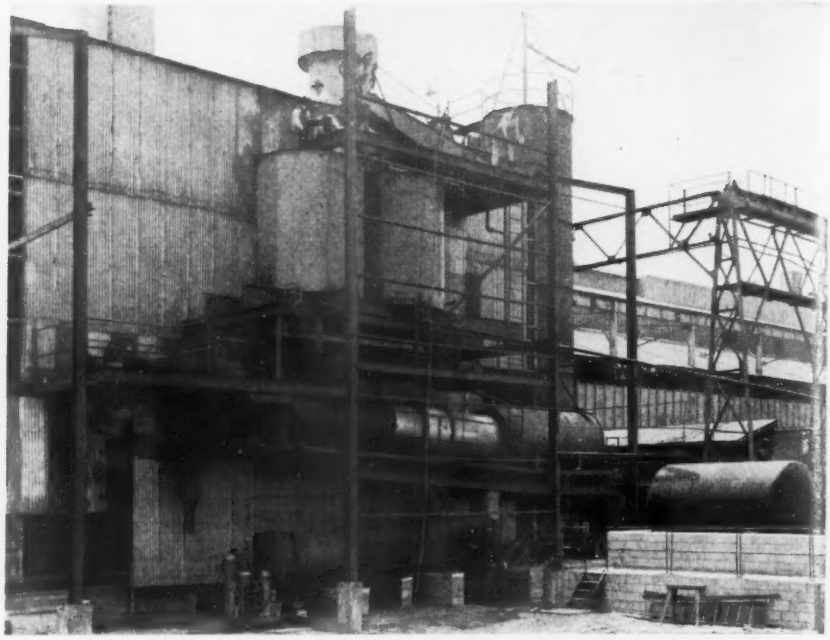
Brass foundry sand is prepared in elevated mixer at left and transported by hopper car over monorail (upper right) for discharge into molders' hoppers

ladles. The station is well ventilated by a side exhaust hood, which removes smoke and fumes. The mold conveyor then enters a tunnel and proceeds to the shakeout. The tunnel has one break to permit the transfer of jackets from poured molds to those ready to be poured. At the shakeout the conveyor car tops are tilted by a cam and the molds are dumped onto the grid. Sand falls through to a return conveyor belt, and castings and sprue are raked off onto pans suspended from a monorail conveyor. The monorail heads upward at this point and the castings travel overhead until they reach the cleaning room—about a 2½ hour journey.

Molding sand for both the No. 1 and the No. 2 intermediate lines is received by overhead belt conveyor from a central preparation plant. This unit is comprised of two mullers, each with a capacity of 40 to 50 tons of sand an hour. The mullers, equipped with de- (*Please turn to page* 188)

Two modern shower and locker rooms serve the foundry. They are at opposite ends of the plant's second floor

Foundrymen everywhere are on the watch for means of cutting costs while maintaining casting quality. Here's how one foundry did both by employing . . .



View shows sand reclamation unit during process of construction, before housing had been built

WET SAND RECLAMATION

By HUBERT CHAPPIE
Foundry Superintendent
National Supply Co.
Torrance, Calif.

IN 1949 our firm decided to make a thorough study of sand reclamation, and ascertain if it would be a good investment. It was kept in mind that the sand must be satisfactory to produce large castings with good surface finish.

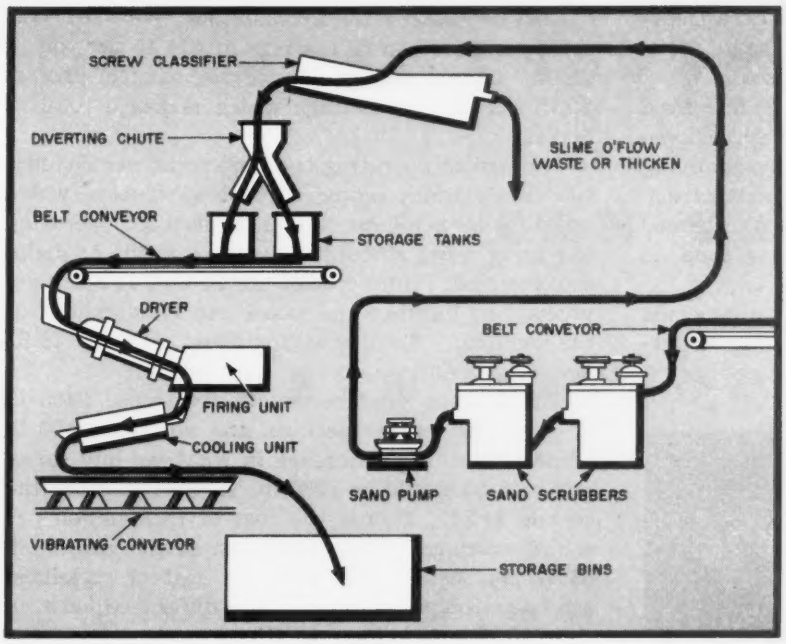
Average weight of castings we produce is 400 lb. During the last four years all facing used has been made of new sand. Since castings weighing as much as 35,000 lb are made, it was felt that the best sand obtainable should be used. Consumption of Ottawa silica sand was 2400 lb per ton of casting.

An investigation was made of all the different methods on the market, and all published literature pertaining to sand reclamation was studied. After studying Research Report No. 23 of the Steel Founders' Society of America dated April, 1950, entitled "Sand Reclamation," it was decided to install a wet sand reclamation system, using equipment supplied by Denver Equipment Co., Denver. The unit was completed and ready for a test run in August, 1952.

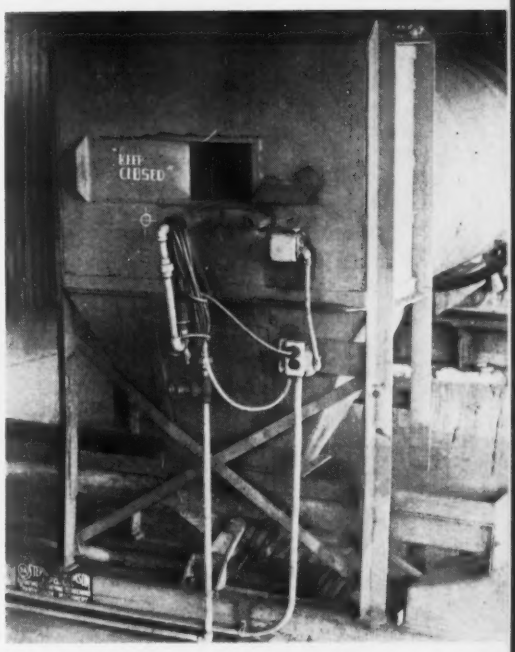
The sand reclamation equipment consists of these major parts in order of their usage: Two scrubbers, sand pump, rake classifier (now a screw classifier), two storage tanks, belt feeder, dryer, cooler, firing unit or calciner, and vibrating screen belt.

The first sand received from the cooler was at a temperature of 500° F—too hot to use and place in storage. It was decided that the rake classifier pushed too much water into the hoppers (over 20 per cent moisture). The rake classifier was removed and replaced by a screw conveyor, which proved satisfactory. It was recognized that to calcine the sand—which required heating it to 1100° F—it was necessary to have about 1500° F at the firing unit. This presented many maintenance problems and it was apparent that operation of this unit would involve a rather high maintenance cost.

At this time the research papers and articles on sand reclamation again were reviewed for a definite statement regarding the effect of the carbonaceous material. Nowhere was it stated that the carbonaceous coating on facing sands was harmful. An excerpt from Research Report No. 23 of the Steel Founders' Society states, "The investigation



Schematic diagram of the sand reclamation unit depicts arrangement of its various components



After exposure to water spray in cooler, sand falls on a vibrating belt and goes to storage

reveals that the ignition of a clay-containing sand is not a beneficial method of reclamation. However, an ignition treatment in the absence of clay is a satisfactory reclamation method but no more so than that resulting from an efficient water scrubbing reclamation. Since the difference between the two methods is the presence or nonexistence of a carbonaceous coating on the sand grains, it appears that the carbonaceous coating exerts little influence upon the casting behavior or mold properties of the rebonded, reclaimed sands when used as mold facings."

Therefore, it was decided to abandon the calcining process and dry the sand only at a temperature a little above 200°, but the sand still was too hot. Capacity then was reduced from 3 tons per hour to 2 tons per hour. This lowered the temperature but not enough to satisfy requirements.

Later in the year the author visited a foundry in Milwaukee with a similar installation for sand reclamation. The major differences in the setup were observed which materially contributed to a cooler sand. The first was that the firing unit was installed right at the beginning of the drying unit where the sand entered, while ours was installed at the opposite end of the drying unit where the sand became hottest when ready to enter the cooling unit. The second major difference was much more travel time on belts before entering the storage tank; this contributed to cooler sand. To make these corrections in our installation would be practically impossible without a great expenditure.

In discussing the hot sand problem with Clyde B. Jenni, General Steel Castings Corp., Eddystone, Pa., he informed me that they had the same trouble in getting started. This problem was corrected in his plant by placing a water spray in the cooler which would develop a fog or mist of water sufficient to cool the air, but not wet the sand. We tried this at an expenditure of less than $50 and it was successful. As the sand in the cooler reached the temperature of 150° F the water was turned on automatically and now the sand temperature never exceeds that figure. Most of the time it is room temperature. This was the last stumbling block which was overcome and has made the sand reclamation unit a success.

The area for our sand reclamation unit is 14 x 60 x 40 ft, not including the area of the fuel tank and sump. The clay content of new sand is usually 0.02 per cent and after sand reclamation is 0.05 per cent. The moisture of the sand entering from the screw conveyor to the hoppers is 20 per cent. After remaining in the hoppers overnight the moisture, before entering the dryer, is 10 to 12 per cent.

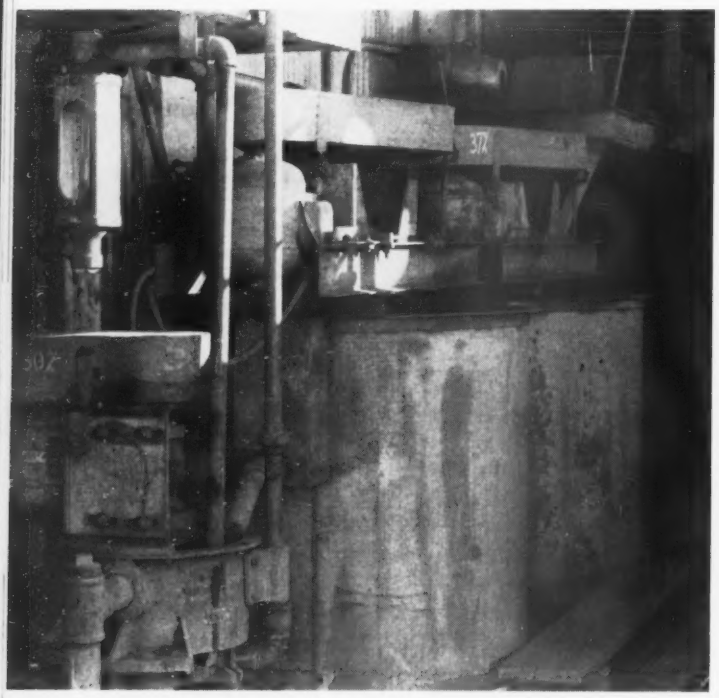
The temperature of our firing unit located at the end of the dryer is 400° F. Opposite end of the dryer where the sand enters is at a temperature of 260° F. The carbon content of the sand after reclaiming has never exceeded 0.11 per cent. The sand reclamation unit has been checked periodically and consistently shows 3 tons per hour.

During the period from December, 1952 through November, 1953, 1120 lb of sand per ton of castings was used, compared with 2400 lb of sand per ton of castings before sand reclamation. This is higher than anticipated. However, in October, 1953, the usage was approximately 800 lb per ton of castings. Goal is in the neighborhood of 600 lb. The figure of 1120 lb of sand per ton of castings includes the very beginning of the sand reclama-

tion when sand was being purchased at a heavy rate without knowing just when the sand reclamation system would be proved successful.

Sand as purchased is Ottawa No. 1 fine sand (which we specify from 48 to 53 AFS screening). Typical screen size is given in the accompanying table as well as that of the sand after reclamation. The table shows the screening of the reclaimed sand is comparable to that of the new sand as purchased.

In the beginning the sand from the reclamation unit was 10 per cent coarser than the sand purchased. However, it is now about the same, the difference being in the amount of fines taken out through the system.



Sand is carried to two scrubbers by belt and is transported to the storage tanks through a pump

Cost of Sand Before Reclamation: We used 2400 lb of sand per ton of castings. All facings were made of new sand. The cost of sand as of December 10, 1953 was $2.85 per ton plus $11.60 freight from Ottawa, Ill., or a total cost of $14.45 per net ton f.o.b. our plant. Hence, 2400 lb sand at $14.45 per ton = $17.34 to process one ton of castings.

To this cost must be added the cost of unloading and placing in storage. Also the disposal of the used sand, which in our case is hauled to a neighboring lot purchased for the express purpose to use as fill-in. The crane time needed to load this truck usually was handled before the regular turn of the day shift so as not to interfere with production. This usually meant an extra hour each day at premium wages. Cost of those items is $1.63 per ton of castings. Thus, the cost of our sand for 2400 lb per ton of castings, was $17.34 plus $1.63, or a total cost of $18.97.

Cost of Sand After Reclamation: We used 1120 lb of sand per ton of castings at $14.45 per ton = $8.09. Cost of unloading and disposing of sand is $0.75 per ton of castings which makes a total of $8.84.

The cost of operating the sand reclaimer includes the man's time; power cost of 13 motors which use 49½ hp per hour; diesel oil used for operating the firing unit; amount of water consumed; maintenance cost; rental cost of the 14 x 53-ft area; depreciation; lighting and taxes and maintenance of the building. Total cost for those items is $1.87 per ton of sand.

Since before sand reclamation we used 2400 lb of sand per ton of castings, and now use 1120 lb of new sand, the difference in what we buy today and reclaim would be 1280 lb. At $1.87 per ton the cost is $1.20. This is the cost of reclamation per ton of castings. Hence, the cost of the new sand, $8.84 plus $1.20 = $10.04, the cost of reclaimed sand per ton of castings. The difference between the $18.97 cost before reclaiming the sand and the $10.04 cost of reclaimed sand means $8.93 per ton of castings saved. Based on a 400-ton month, the savings would be $3572 or $42,864 for a year. Our total cost of the sand reclamation unit is $55,000 including installation.

Summary—If we had the privilege of starting anew, we would make two changes which would be beneficial to us. Instead of the hoppers or storage tanks which are used to store the sand, and which allow considerable water to drain off the sand before entering the dryer, we would purchase a filtering unit. While this was not suggested at the time of the original proposal it later was recommended when we were experiencing too much water in the sand. A filtering unit would cost $5000 but it would also eliminate the extra labor required to empty the storage tanks because of sand clinging to the sides. This is a shoveling operation. The man's time would be employed for more satisfactory observance of the operation of the unit.

The second change would place the firing unit at the end of the dryer where the sand enters, instead of at the opposite end where it leaves the dryer to enter the cooler. This would tend to produce cooler sand.

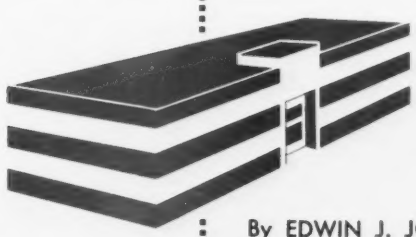
Installing a sand reclaimer unit provides the purchasing agent with more peace of mind as it eliminates the necessity of fretting about cars being delayed due to bad weather or other unforeseen difficulties. It also eliminates the necessity of having a large supply or storage of new sand.

Typical Sand Screen Analysis

Sieve Mesh	Ottawa New Sand Per Cent Retained	Reclaimed Sand
20	....	0.08
30	0.04	0.30
40	2.04	5.84
50	32.30	41.08
70	44.90	36.44
100	16.80	13.26
140	2.84	1.68
200	0.20	0.68
270	0.30	0.02
PAN	0.04	0.02
AFS Fineness No	51.80	48.70

THE SMALL FOUNDRY CAN USE MODERN METHODS

Problems of improving methods occur everywhere. No shop is free of them, regardless of its size, and the failure to recognize them can result from a lack of information on modern methods



By EDWIN J. JORY
Lester B. Knight & Associates Inc.
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Chicago

LITERATURE and advertising directed to foundrymen are filled with news of advancements in foundry operating and technological practices. Application of these techniques usually is more conveniently made by larger foundries, which employ staff personnel well qualified to evaluate them and which may be in a position to make large capital investments if they are needed.

The owner of a small foundry which produces 10 tons or less of castings per day may be his own manager, salesman, shop foreman and accountant. He might be inclined to consider much of this material beyond the scope of his operations. Actually, he never should consider any advancement in the art or science of making castings as something which he can do without until he has made a careful analysis of it.

Common Problems—The problems of improving methods and materials handling occur everywhere, and even the one-man shop is not free of them. The fact is that the problems may exist to a very large degree and still not be recognized because of a lack of information on new methods. What must be realized is that a problem exists wherever there are possibilities for economical improvement, even though they are not self-evident.

A large shop may employ an individual or a staff of industrial engineers for analysis of existing practices, but the small foundryman must learn to make his own analyses if he cannot afford to have people on his payroll to do this work for him. Actually, this arrangement is not far from ideal because he himself proposes and considers ideas and acts upon them, as few outside industrial engineers can. Granted that there always is room for improvement, how, then, is it to be considered?

For the operator of a small shop who sees the desirability and necessity of keeping his shop, and especially his product, abreast of up-to-date techniques and market conditions, it is imperative that he have sources of information. These sources stem from membership and active participation in technical and trade societies, subscriptions to trade journals, plant visitations and the willingness to see and talk to suppliers' salesmen. He will find them not overly expensive and worth many times their cost when properly used.

Evaluate the Data—Having established sources of information, he must train himself in the evaluation of what is available. The information he will gather will be roughly divisible into three classes: Operational, technical and business management data. In all cases, before any specific information can be applied, the foundryman must have a thorough knowledge of his present practices and of his market. Ordinarily, he would have and be expected to have this knowledge at his fingertips, but it would be well for him to re-examine and reassess periodically what is being done. Often certain small factors find their way into an operation to meet a temporary condition, then develop into permanent practices, even when the temporary cause is no longer present.

In the evaluation of operational ideas, the small foundryman may be in a somewhat different position from the big operator. For example, in the large foundry where volume production is the basis of the business, unit output requirements may be about 500 pieces per day on a given type of work. In such an organization, a time reduction of a few hundredths of a minute per unit will be important. However, the owner of a small foundry who may build his business on short runs and quality, may produce only 10 or 20 (*Please turn to page* 264)

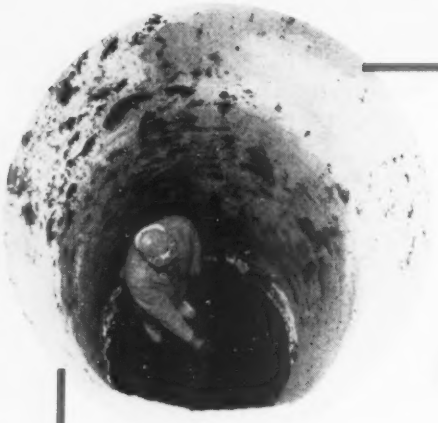

Fig. 1—Bottom doors of cupola are closed as the sand bottom is prepared in a conventional manner

Simple System Provides

RAPID CUPOLA CHARGING

By EDWIN BREMER
Metallurgical Editor

WATERBURY Farrel Foundry & Machine Co., Waterbury, Conn., manufacturer of machinery for production of bolts, nuts and screws, power presses, cold rolling mills, wire and rod drawing machines, produces a wide variety of gray iron castings. These castings, ranging in weight from a few pounds to several tons, are used in the equipment the company builds.

Iron is melted in two cupolas lined to 54 in. which are used alternately, and the average daily run is 25 tons of castings. Beds of the cupolas extend 52 in. above the tops of the tuyeres, and the iron charges weigh 2000 lb with 250 lb coke splits. Iron from the cupolas runs directly into a stationary forehearth (Fig. 2), 54 in. in diam, which holds 10 tons of iron and insures a thorough mixing of the separate charges to provide a uniform composition at the spout.

Opening at the bottom of the cupola through which the metal flows into a covered channel connected to the forehearth, is formed of silicon carbide brick (Fig. 3) and is 2 in. high and 12 in. long. Channel between cupola and forehearth is 18 in. wide and 24 in. high, as indicated in Fig. 4, where it opens into the forehearth. Linings of both cupolas and forehearth are repaired or patched with a refractory mix which is applied by a pneumatic gun.

With Waterbury Farrel's type of operation, semi-mechanical charging of the cupola has been found quite satisfactory over a period of years. The procedure includes use of a yard crane equipped with a magnet for charging metals into steel tote boxes, a gasoline driven end-loading scoop truck for handling coke from the bin to the tote boxes, and a platform truck for conveying the tote boxes to and from the charging floor via an elevator.

The tote boxes, as may be observed in Fig. 5, are equipped with legs and open at one end. Upper portion of the sides at the open end are cut off at an angle to permit tilting upward at the cupola charging door without interference, as shown in Fig. 6. Hooks on the bottom of the closed end are engaged by the elevating mechanism of the truck to tilt the tote box sufficiently to discharge its contents into the cupola. Metal charges of pig and scrap weighing 2000 lb are placed first in the box, followed by the coke split of 250 lb and 20 lb of limestone.

As originally set up, 15 tote boxes were used with two men and a crane man to fill them with metal and coke and convey them to and from the cupola. When the day's heat was finished all the tote boxes were filled, conveyed to the charging floor, and left there for the next day's operation. That arrangement filled a two-fold purpose. One was that since the cupola holds about 12 charges, there were enough charges on hand to proceed with filling the cupola as soon as the bed coke was placed. The other was that in case of elevator failure, loaded tote boxes were available to permit uninterrupted charging for over an hour.

Fig. 2—Iron from cupolas runs directly into a stationary forehearth, which holds 10 tons

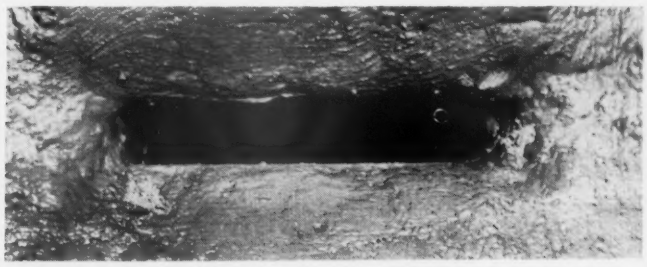

Fig. 3—Slot 2 x 12 in. is cupola side of passage to the forehearth for molten iron, slag and gases

Fig. 4—Opening 18 x 24 in. is the forehearth side of the same passage between cupola and forehearth

Fig. 5—Pig is first material into charging bucket. All materials are weighed accurately

Fig. 6—Tote boxes permit tilting upward at the cupola charging door, without any interference

After the system was in operation for some time, L. J. Litalien, metallurgist with the firm, became convinced that improvement could be made. After some study he developed the method used at present which requires the service of only one man and the crane man. To accomplish this 15 additional tote boxes were purchased, making a total of 30. As in the case of the earlier system, all boxes are filled at the end of the day's heat and left on the charging floor. With 30 boxes the cupola can be fully charged and still leave enough emergency charging for about 1½ hours.

In operation the man charging the cupola fills it, using the necessary number of boxes from those lined up on the charging floor (Fig. 7). Next he takes an empty box down on the elevator and places it on the scale. As soon as the box has received its charge of metal, he dumps on the coke from the end-loading scoop which he previously had loaded. He then reloads the scoop (Fig. 8) and places it by the scale. Next he takes

Fig. 7—Charging system requires services of two men, crane man and one other, shown here leaving elevator. Note charging platform and full charging buckets

Fig. 8—After tote box on scales has received pig, charging man uses a front-end loader to load coke. The bucket holds 1 cu yd, or about 250 lb, which is just enough for one charge

Fig. 9—As clearly illustrated by this view, the cupola is charged to the door. Note even level of charges at the door

the filled tote box up to the cupola, dumps its contents (Fig. 6) and returns the box to the scale. This cycle is repeated at the rate of 5 minutes from scale to scale until the melting operation ceases. Then all empty boxes are filled and placed on the charging platform.

As might be expected with the wide variety of machinery produced by Waterbury Farrel, the sizes and section thicknesses of gray iron castings required vary considerably. To meet desired physical and mechanical properties, the firm produces irons in four strength classifications to meet requirements specified in ASTM standard A-48 for classes 25, 30, 40 and 45, and occasionally class 60.

These irons are produced by variations in the amounts of pig iron, cast iron scrap and steel scrap charged into the cupola as well as by additions of some alloying agents in certain instances. To all classes of iron the firm adds 0.25 per cent potassium-titanium fluoride. This addition will provide irons with machining and wear resistant properties superior to normal gray irons, and also to give an excellent response to heat treatment. The potassium-titanium fluoride previously weighed into tin cans and kept on the charging floor is placed on top of the cupola charge.

The class 45 iron is used in the as-cast state for castings weighing over 5 tons or those 4 x 5 x 10 ft in size. As stress-relieved at 1200° F, it is used for such castings as header, trimmer, crank eyelet and other special frames, gears, wire blocks and other parts requiring high strength or good wearing qualities. Oil quenched from 1550 to 1600° F and drawn at 375° to give a Rockwell C minimum hardness of 50-52, the iron is used for liners, cams and hopper slides.

Class 40 iron is stress relieved at 1200° F and used for press and rolling mill frames, balance wheels, etc., which are over 2 in. in cross section. Stress relieved, Rockwell C hardness is 18 to 23.

Class 30 iron is used in the as-cast state for castings over 5 tons in weight or 4 x 5 x 10 ft in size. It also is used in the stress-relieved state for some castings. Hardness in both states is 16 to 18 Rockwell C.

Class 25 iron is used in castings where open grain structure is not detrimental. As-cast it is employed in castings weighing over 5 tons or 4 x 5 x 10 ft in dimensions. It also is used for pedestals, bases, legs, hoppers and guards. After stress relieving it is used for all unbushed machinery, caps, bushings, press and eyelet machine parts except frames. Rockwell C hardness of this class of iron is 14 to 16 in both the as-cast and stress-relieved conditions.

After the castings are removed from the sand, they are loaded on skips and taken to the cleaning department, which is located in a separate building adjacent to the foundry. It is 84 x 130 ft and constructed of brick. Small castings are cleaned by abrasive blasting in a tumbling type machine, followed by grinding and chipping operations. Large castings still containing their cores first are placed in a hydraulic blast room where they are subjected to a waterblast at 400 psi to remove adhering sand as well as the cores. After washing the castings are placed in a blast room where they are cleaned further by abrasive blasting with steel shot. Then they are taken to the floor for chipping and grinding with portable tools. Cleaned castings are loaded on skids and forwarded to the machine shop.

Fig. 10—Class 45 iron designated in ASTM standard A-48 is used for castings over 5 tons. View shows pouring of 8-ton casting. Note risers back of weights

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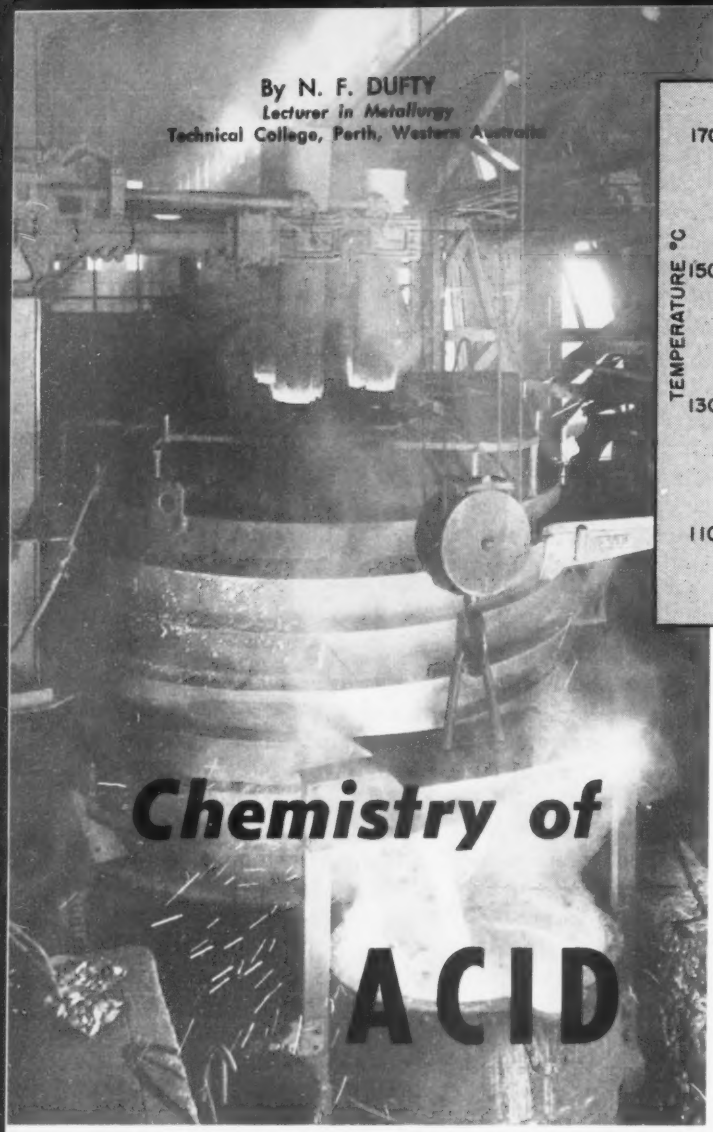


Chemistry of ACID ELECTRIC STEELMAKING

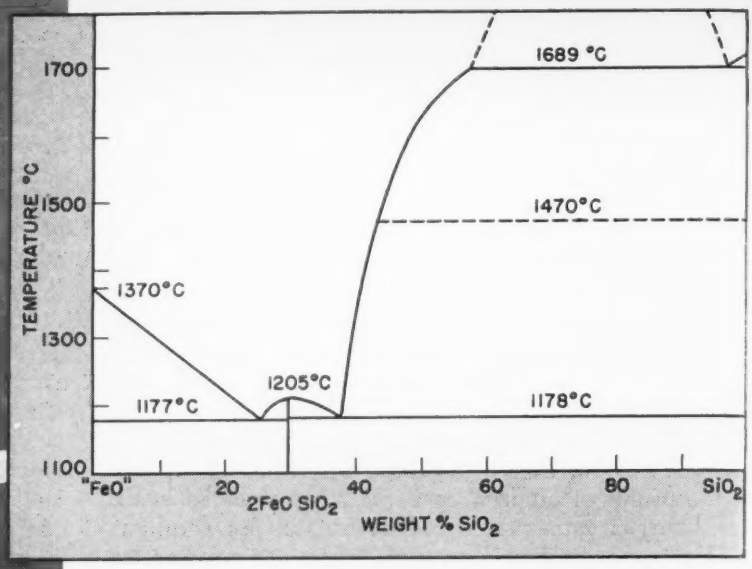


Fig. 1—Thermal equilibrium diagram, FeO-SiO_2 (Bowen and Schairer[2]; Greig[3,4]; and Hay, Howat and White[5])

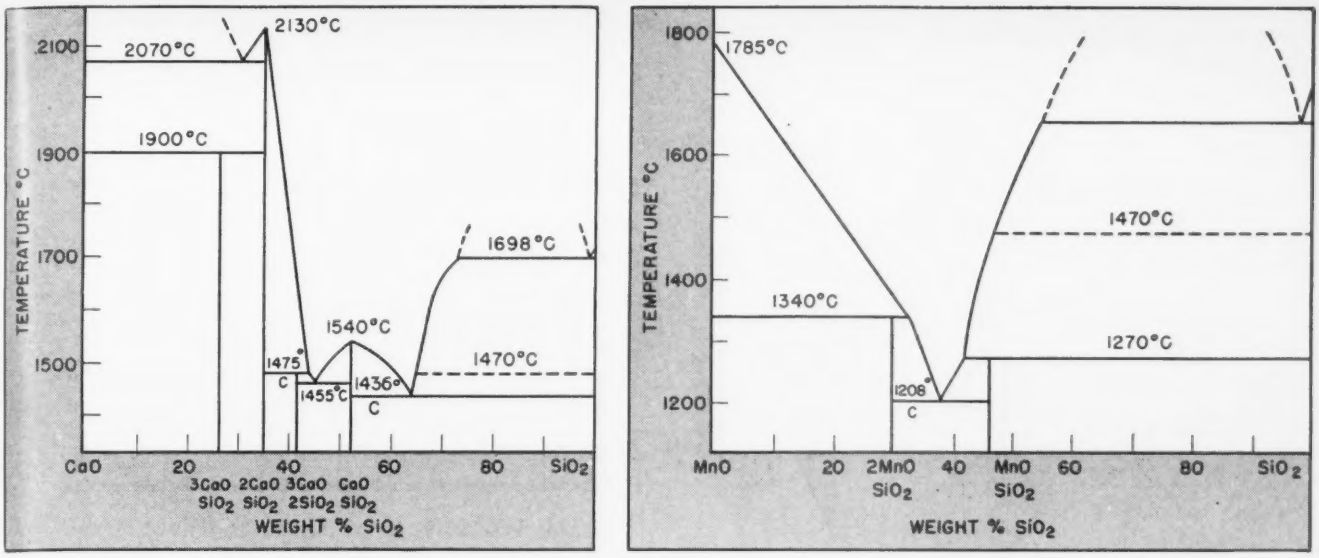
ACID ELECTRIC furnace process is, in many ways, intermediate between the acid open-hearth and the acid side-blown converter. The reactions are primarily slag-metal as in the acid open-hearth, but the rapid oxidation during the "blow" and the high temperature at the conclusion of the carbon boil make the process essentially similar to the acid side-blown converter in these respects.

Close control of power input and, therefore, slag and metal temperatures is a great advantage but carries with it two partially compensating disadvantages. First, it is possible to make steel that is hot enough to cast satisfactorily without having a boil at all, but the resultant product is usually dirty and gassy. Second, an inexperienced or careless melter can easily ruin the bottom and banks of the furnace by overheating. This leads to a high silica slag and unsatisfactory electrical and metallurgical conditions. These disadvantages are not inherent in the process but are due to the misuse of a versatile and efficient steelmaking unit.

Slag Systems — An understanding of the equilibriums between the major slag constituents is necessary to fully understand the chemistry of the process as most of the reactions occur through the medium of the slag.

Oxides of iron, manganese and calcium each form binary systems with silica; in all cases the basic oxide forms at least one silicate. Calcium is the largest and most electropositive of the three metal ions and forms four silicates; manganese forms two and iron only one. The lattice spacings of the three oxides are shown in Table I.

As liquid silica and the silicates concerned are only partially soluble in one another, the three binary diagrams are distinguished by an immiscibility range in the liquid state at high silica



Figs. 2 and 3—Thermal equilibrium diagrams for $CaO\text{-}SiO_2$ (Rankin and Wright[7]; Greig[8]; Bowen, Schairer and Ponsjak[9]) and $MnO\text{-}SiO_2$ (White, Howat and Hay[6])

content. Otherwise they are of the usual eutectiferrous type (see Figs. 1, 2 and 3). This has a bearing on the attack of silica linings by silicate slags as the liquidus in each case rises steeply to a monotectic horizontal so restricting the solubility of solid silica in the molten silicates at normal steelmaking temperatures.

For the sake of simplicity the system $FeO\text{-}SiO_2$ is considered to be a binary one though ferrous oxide probably undergoes peritectic dissociation on melting with the formation of iron and ferrosoferric oxide (magnetite). The three basic oxides combine with silica to form three ternary systems. Replacement of these oxides by one another along the ortho and metasilicate joins is a characteristic feature and one which greatly simplifies the study and control of acid slags.

The form of the $FeO\text{-}MnO\text{-}SiO_2$ diagram (Fig. 4) is relatively simple due to the extensive formation of solid solutions. Two eutectic troughs cross the diagram approximately parallel to the solid solution series and the fusion surfaces slope evenly toward the $FeO\text{-}SiO_2$ side of the diagram. With increasing silica, the liquidus surface rises steeply until it meets the plane under the biliquidal zone. Due to the position of the liquidus surface the silica content of a silica saturated slag at 2900° F is about 50 per cent and is scarcely affected by variations in the FeO/MnO ratio.

The isotherms of Fig. 5 illustrate the general form of the liquidus surface of the $CaO\text{-}FeO\text{-}SiO_2$ system. Moving from the $FeO\text{-}SiO_2$ binary to the $CaO\text{-}SiO_2$ binary the width of the biliquidal zone decreases with the limit running nearly parallel to the upper eutectic trough. Below the temperature of immiscible liquid formation the silica content of silica saturated $CaO\text{-}FeO\text{-}SiO_2$ slags increases with the CaO/FeO ratio. In the quantities usually found in acid electric furnace slags, MnO can be substituted for FeO in the $CaO\text{-}FeO\text{-}SiO_2$ system without change in the type of reaction.

Natural Acid Slags—If no lime is added, acid slags usually consist of 95 per cent iron oxide, manganese oxide and silica, approaching the ternary system of Fig. 4. Slags of this type containing more than 50 per cent silica are approximately in equilibrium with the hearth at steelmaking temperatures. Microstructures of the slowly cooled or annealed slags consist chiefly of silica in a fayalite-rhodonite ($FeO \cdot SiO_2\text{-}MnO \cdot SiO_2$) ground mass[2]. A MnO/FeO ratio of 27/73 is the limit of the homogeneity range; above this figure tephroite ($2MnO \cdot SiO_2$) appears. Alumina, magnesia and ferric oxide all occur in small quantities but are not normally significant and usually enter into solid solution in the silicates.

When lime is added to an acid slag it enters the silicates as a substituent up to 7.8 per cent. Above this figure, vogtite ($CaO \cdot FeO \cdot MnO \cdot 3SiO_2$) appears. The most important effect of lime additions is to increase the silica content of silica saturated slags at a given temperature.

From a statistical examination of 110 acid finishing slags, Hay, White and Ferguson[3] found that the ratio of the molecular percentages of lime, ferrous oxide and manganese oxide to silica was appreciably constant between 0.60 and 0.66 to one. This is not directly applicable to acid electric furnace practice owing to the higher temperatures involved (the above data was from acid open-hearth slags) but it does imply that the oxides of calcium, iron and manganese are mutually replaceable on a molecular basis because lime, weight for weight the most effective flux, has a lower molecular weight than either of the other two oxides.

Liquid Slag—The constitution of liquid slags is difficult to determine experimentally; microscopic and x-ray examination of the solid slags is no more than a useful guide. It is extremely probable that compounds occur in the liquid slags. Schenck and

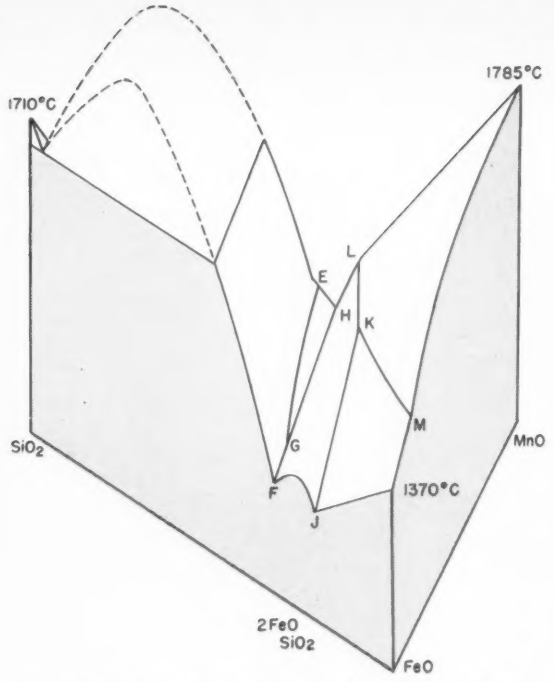


Fig. 4—Diagram shows the liquidus surface of system FeO-MnO-SiO_2 (Hay, White and McIntosh[11])

TABLE I—Lattice Spacings of Oxides

Lattice Spacing in kX units[1]	Oxide
4.80	CaO
4.44	MnO
4.30	FeO

TABLE II—FeO-Temperature Relationship

Temperature ° F	2785	2830	2875	2920	2965	3010	3055
Free FeO, per cent.....	3.50	3.80	4.10	4.40	4.70	5.05	5.40

TABLE III—Values of Constants

Temperature ° F	K_1	K_2	K_3
2732	0.049	2.25	925
2822	0.065	4.40	1030
2912	0.085	8.40	1150
3002	0.110	15.30	1280
3092	0.141	27.40	1395

TABLE IV—Effects of Lime Additions

CaO Per Cent	SiO_2 Per Cent	FeO Per Cent	MnO Per Cent	L_{FeO}	[FeO]
0	50	35	15	.0090	.315
5	52	30	13	.0103	.309
10	54	26	10	.0108	.280
20	60	14	6	.0113	.158
30	63	5	2	.0122	.061

TABLE V—Typical Heat Log

Sample No.	Time	Remarks (6 ton charge)	Temperature, ° F	Steel C	Steel Mn	Steel Si	Slag SiO_2	Slag FeO	Slag MnO	Slag CaO
1	1:50	Before melt	2772	.40	.40	.30	46.0	40.0	10.0	2.0
2	2:00	Clear melt	2932	.37	.20	.07	50.0	35.0	10.0	2.0
3	2:10	Oxygen blow 50 lb. limestone and 220 lb. silicomanganese	3042	.17	.12	.05	63.0	23.0	12.0	2.0
4	2:17		3020	.17	.90	.40	56.0	17.0	16.0	9.0
5	2:20	Tapped		.15	.82	.36				

Sample No.	Viscosity (Inches)	K_1 Calc.	K_1 Act.	K_1 %	K_2 Calc.	K_2 Act.	K_2 %	K_3 Calc.	K_3 Act.	K_3 %
1	14	.057	1.60	3.5	3.3	480	0.68	975	188	520
2	10	.090	0.70	12.8	9.7	86	11.30	1176	175	672
3	2	.125	0.23	55.0	20.0	26	77.0	1320	500	252
4	4	.116	0.94	12.4	17.7	116	15.3	1303	126	1030

Sample No.	[FeO] From L_{FeO}	[FeO] From [Si]	[FeO] From [C]
1	0.31	0.023	0.035
2	0.35	0.110	0.038
3	0.28	0.200	0.082
4	0.20	0.110	0.082
5	....	0.110	0.093

Bruggeman[4] assume the orthosilicates to be the stable compounds but White[5], and Krings and Schackmann[6] conclude that the stable compounds are the metasilicates. Taylor and Chipman[7], on the other hand, assert that any compounds between ferrous oxide and silica are completely dissociated at 2900° F.

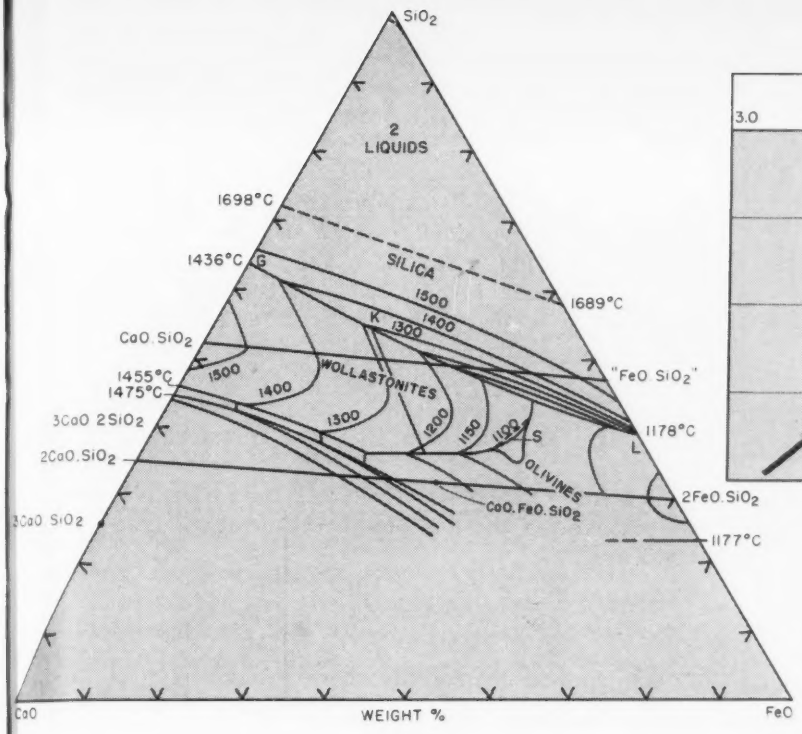
White's[5] work on ferric oxide dissociation equilibriums in liquid melts accounts for all the observed phenomena by regarding the melts as ideal solutions in one another of the various compounds observed in the solid slags and applying the laws of mass action. At steelmaking temperatures these compounds partially are dissociated into their constituent oxides. The dissociation constants indicate that rhodonite ($MnO \cdot SiO_2$) is slightly and ferrous silicate ($FeO \cdot SiO_2$) considerably less stable than wollastonite ($CaO \cdot SiO_2$).

Ideal solution laws are assumed to govern slag-metal relationships and the equilibrium constants for the slag-metal reactions can be calculated. Chemical analysis gives total concentrations but when evaluating the equilibrium constants only chemically free reactants should be considered. Therefore, only if there is no compound formation can these constants be true mass action constants.

An increase in the free ferrous oxide content of the slag does not materially affect the dissolved iron oxide in the metal until the carbon content falls below 0.15 per cent. This is because of the carbon-iron oxide reaction; in the presence of carbon the partition coefficient, $L_{FeO} = [FeO]/(FeO)$ influences only the supply rate of iron oxide from the slag to the metal. (Square brackets indicate concentrations in the metal, round brackets those in the slag.)

Lime additions stabilize some of the silica as calcium silicate and so increase the free iron oxide content of the slag. An increase in manganese oxide content acts similarly and a rising temperature leads to increased dissociation of all the silicates and again an increase in the free iron oxide content. Schenck's[8] calculated figures for a slag containing 15 per cent FeO, 25 per cent MnO and 60 per cent SiO_2 are given in Table II and Fig. 6.

Slag-Hearth Reactions—Slag attack of the hearth may be considered as a simple solution process



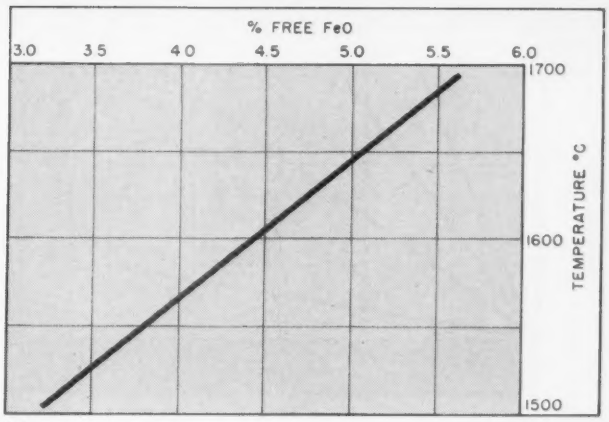


Fig. 6 (above)—Computed values for slag with 15% FeO, 25% MnO and 60% SiO_2

Fig. 5 (left)—Isotherms illustrate general form of liquidus of CaO-FeO-SiO_2

and one very important factor governing such attack is the diffusion coefficient of silica in the slag. The combined influence of increased solubility, fluidity and diffusivity caused by an increase in temperature naturally results in increased slag attack. Higher solubility accentuates slag-line attack not so much by increasing the concentration of silica in the slag at saturation point as by increasing the concentration gradient and with it the rate of diffusion.

The influence of diffusivity needs no explanation as the chemical exchange necessary for the reaction to take place depends entirely on the molecular transport in the slag. As the fluidity increases, the flow velocity of the film immediately adjacent to the hearth is raised and the film thickness reduced; resulting in a more rapid feeding of fresh and unsaturated slag. It is necessary to distinguish between a change in viscosity due to temperature and one due to a change in composition.

An increase in temperature and the consequent decrease in viscosity always results in increased slag attack. A fall in the viscosity of an acid slag by lime additions, provided that there is sufficient carbon in the bath to react with the iron oxide that is freed, does not result in increased slag attack as the diffusion rate is influenced not only by the viscosity but also by the changes in the ionic radii of the slag components.

Very little slag-line attack occurs during the carbon boil. This may appear strange as the physical action of the boil would naturally tend to assist in feeding fresh, unsaturated slag to the hearth-slag interface and so increase the rate of solution of the silica. Under these conditions, however, reactions between the iron and manganese oxides in the slag and the carbon, manganese and silicon in the steel tend towards equilibrium with a consequent decrease in the chemically free oxides in the slag. The real danger occurs when a thin oxidizing slag is present and the bath is low in carbon and high in silicon and manganese or subject to physical conditions which inhibit the carbon boil.

With a soft melt, and therefore a bath low in carbon, silicon and manganese, the free iron and manganese oxides in the slag will attack the hearth until the slag becomes saturated with silica and therefore in equilibrium.

If the entire hearth surface becomes covered with a thin film of viscous slag—and there is experimental evidence to show that this does occur—there is no liquid-solid interface between the bath and the hearth. Under these conditions the carbon boil becomes difficult to initiate despite the fact that the carbon-iron oxide product is far in excess of the equilibrium value. This phenomenon will be dealt with more fully later. The presence of a high iron oxide slag on a quiescent bath will again result in severe slag-line attack and possibly some fluxing of the roof.

A far more frequent occurrence in acid electric furnace practice is the melting out of a bath with high residual silicon and manganese contents. This is usually due to the fact that the charge often contains 50 per cent foundry scrap with average manganese and silicon contents of 1.0 and 0.4 per cent, respectively. While the atmosphere in the acid electric furnace is not reducing it is far from being as oxidizing as that in the acid open hearth.

Once a bath is formed and covered with a siliceous slag there is little chance of oxidation. As ferric oxide is unstable in the presence of excess silica, the oxidation mechanism of the basic furnace, ferrous to ferric oxide at the slag surface and ferric to ferrous oxide at the slag-metal interface, does not operate. Before the carbon boil can start, the silicon and manganese contents must be reduced to low limits.

This is usually done by adding iron oxide to the

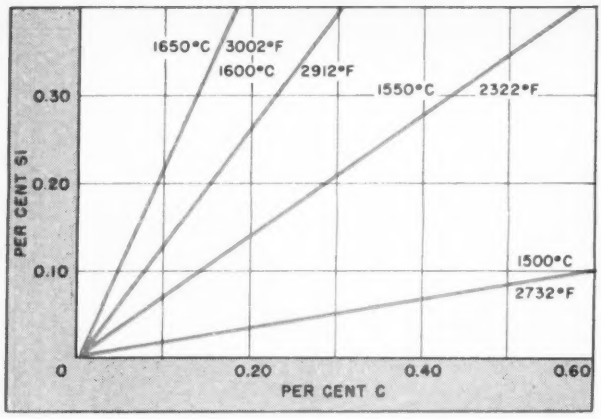


Fig. 7—Chart shows theoretical values of silicon increment phenomenon at high temperature

slag unless, judging by its color and viscosity, it already contains sufficient. Conditions now present are a slag containing 30-40 per cent iron oxide and liquid steel containing say 0.30 per cent C, 0.70 per cent Mn and 0.30 per cent Si, all at a temperature between 2800 and 2950° F. In this temperature range the residual silicon is high enough to prevent the dissolved iron oxide from rising sufficiently to reduce the carbon below 0.30 per cent. No carbon boil is possible and the slag tends to become heterogeneous.

Reaction occurs between the dissolved iron oxide in the steel and the silicon and manganese, more iron oxide diffuses from the slag to satisfy the partition coefficient and the layer of slag immediately adjacent to the slag-metal interface becomes impoverished of iron oxide and therefore unreactive. Equilibrium is attained between the metal and the layer of slag just above it, not with the slag bulk as a whole. The upper layer of slag reacts with the lower one, dissolving silica from it and supplying it with iron oxide at the same time.

Simultaneously the upper slag layer is attacking the slag line and disolving silica from there as well; in this way exceptionally severe slag line erosion may occur. This is far more likely to happen in the acid electric furnace than in the acid open hearth as a rapid rise in temperature, and therefore in slag activity, is merely a matter of power input. A similiarly rapid rise in temperature is impossible in the acid open hearth until the carbon boil starts and improves the heat transfer from the flame.

Slag-Metal Reactions—Excluding the carbon boil, which involves the gas phase, the principal reactions are:

$$Mn + FeO \rightleftharpoons MnO + Fe$$
$$Si + 2FeO \rightleftharpoons SiO_2 + 2Fe$$
$$Si + 2MnO \rightleftharpoons SiO_2 + 2Mn$$

The equilibriums for the above reactions can be expressed by the following equations:

$$K_1 = \frac{[Mn]\ (FeO)}{(MnO)}$$
$$K_2 = [Si]\ [FeO]^2$$
$$K_3 = \frac{[Si]\ (MnO)^2}{[Mn]^2}$$

Values of these constants for the pure Fe-Mn-Si-O system are given in Table III from Schenck's data[9].

These constants are not true equilibrium constants as some of the reactants are bound up in undissociated compounds. McCance[10] has suggested that changes in slag composition may cause changes in the activity coefficients of the reactants and so lead to the observed variations in the equilibrium constants. Herasymenko[11] puts forward the view that slag components undergo complete dissociation of the ionic type but although this is supported by the fact that molten slags have appreciable conducivity, observed reaction rates tend to disprove the theory.

The reactions occurring in the acid electric furnace take place more rapidly than in the acid open hearth, mainly due to the high rate of heat input possible. For this reason, and also possibly due to the formation of a high silica film on the surface of the bath, equilibrium is only approached toward the end of the boil. It is often stated that the reaction:

$$2C + SiO_2 \rightleftharpoons 2CO + Si$$

may occur between the carbon in the bath and the

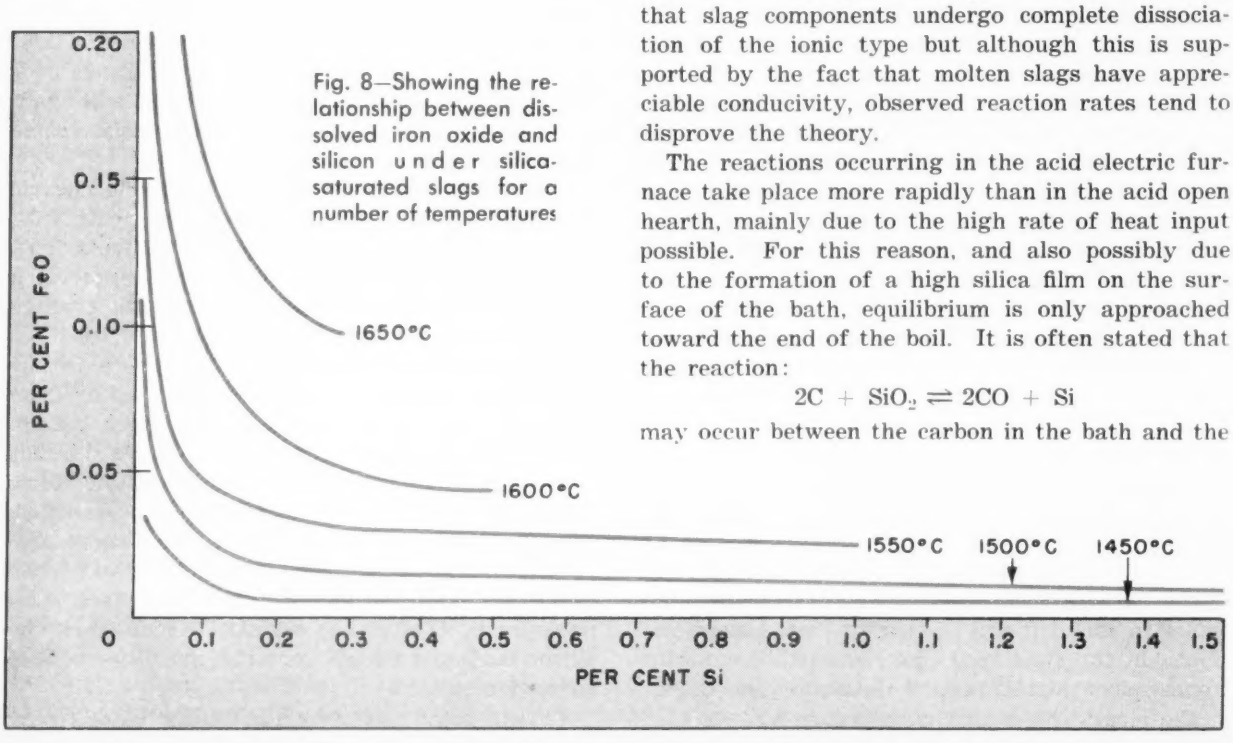


Fig. 8—Showing the relationship between dissolved iron oxide and silicon under silica-saturated slags for a number of temperatures

silica in the slag.

This is improbable in view of the low solubility of the carbon in the slag and of the silica in the molten iron. The phenomenon of silicon increment at high temperature is purely one of carbon-silicon equilibrium in liquid iron in contact with silica and at one atmosphere pressure of carbon monoxide. Fig. 7 [12] illustrates this but the theoretical values are rarely attained in practice due to the entry of iron oxide from the slag to satisfy the partition coefficient. Even so, silicon increment at the rate of 0.01 per cent per minute is possible toward the end of the carbon boil when the iron oxide content of the slag is low and the temperature high. Some silicon pick-up may occur due to the reaction between the carbon of the electrodes and the silica in the slag. This is favored by the high temperature and short arc accompanying very high rates of power input, but the silicon so released will first react with the iron oxide of the slag and will not enter the metal until this figure is reduced to 3-5 per cent.

Carbon Oxidation—Carbon has been shown by Yap Chu-Phay[13] and Chipman[14] to exist in the liquid steel as the carbide, Fe_3C, but the oxidation of carbon is considered for the sake of simplicity as:

$$FeO + C \rightleftharpoons CO + Fe$$

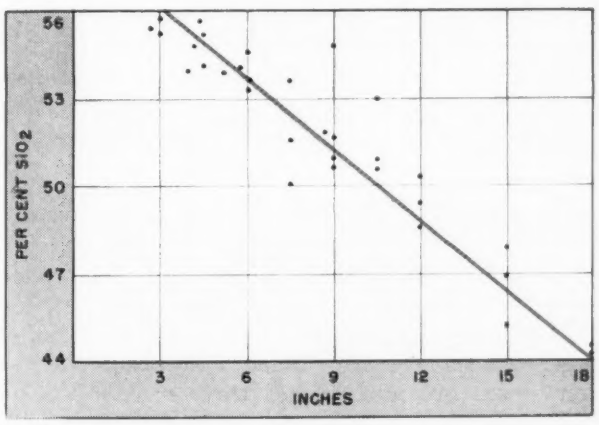


Fig. 9—Chart demonstrates that slag viscosity is in close relationship to the silica content

This gives the equilibrium constant for the reaction:

$$K_4 = \frac{P_{co}}{[C]\ [FeO]}$$

and a reaction velocity of:

$$v = k_1\ [C]\ [FeO] - k_2 P_{co}$$

Under normal conditions the value of P_{co} in the acid electric furnace during the carbon boil can be taken as 1.10 so that the velocity at a given carbon content will depend on the iron oxide dissolved in the steel. This theory, which has Schenck as its chief supporter, unfortunately does not account for many of the phenomena encountered in actual steelmaking practice. Brower and Larsen's[15] theory

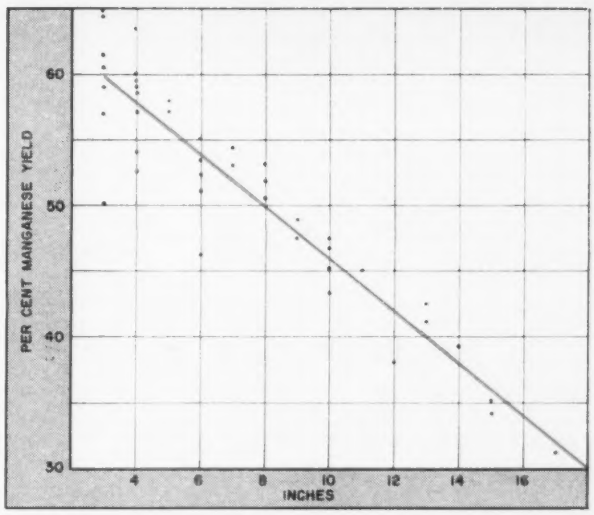


Fig. 10—Viscosimeter gives good indication of oxidizing power and manganese recovery of slag

and its later refinement by Sims[16], offers a far more satisfactory explanation.

This is based on the concept that bubble formation plays a vital part in the carbon boil. A bubble of carbon monoxide must, in the first place, be extremely small and the surface tension forcing the gas back into solution must therefore be extremely large. The pressure on a bubble due to surface tension can be calculated from the equation:

$$P = \frac{2\pi rT}{\pi r^2} = \frac{2T}{r}$$

when T is the unit surface tension of liquid steel taken at Bircumshaw's[17] value of 1500 dynes per square centimeter and r is the bubble radius. At a pressure of 1.10 atmospheres the smallest bubble that can exist has a radius of 0.028-mm.

Surfaces favoring bubble formation are those containing adsorbed gas voids or films which the liquid steel cannot fill due to its surface tension. Carbon monoxide diffuses into these voids or gas films much more easily than it can form a bubble on a perfectly smooth surface. Lump ore, a piece of cold steel scrap or a cold steel rod are examples of externally introduced sources of bubble formation but the solid hearth is the obvious place. Unfortunately an acid hearth is often covered by a thin film of ferrous oxide-manganese oxide-silica slag and for this reason the boil is more difficult to initiate on an acid hearth than on a basic one.

The significant fact is that Brower and Larsen, after studying many thousands of samples, found that the iron oxide dissolved in the bath depended chiefly on the carbon content and was not affected by the rate of carbon drop. Due to the physical limitations imposed by melting furnace conditions, the bottleneck in the carbon boil is the heterogeneous reaction:

$$[CO] = CO\uparrow$$

and Schenck's velocity equation is inapplicable.

Iron Oxide Control—When the carbon in the bath drops below 0.10 per (*Please turn to page* 260)

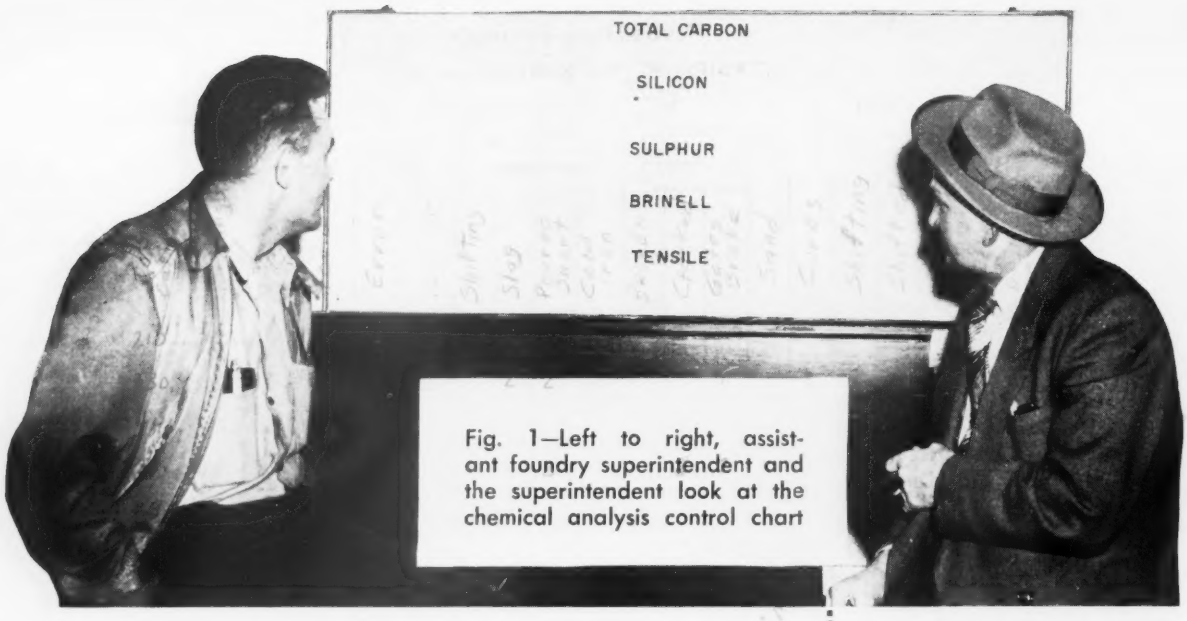


Fig. 1—Left to right, assistant foundry superintendent and the superintendent look at the chemical analysis control chart

QUALITY CONTROL

. . . . in a Gray Iron Foundry

By LESTER WELTY
Director of Quality Control
Dodge Mfg. Co.
Mishawaka, Ind.

Quality control offers limitless possibilities in foundry operations. This article describes a statistical approach to the scrap control problem

DODGE Mfg. Corp., Mishawaka, Ind., is a manufacturer of power transmission equipment, namely, V-belt drives, bearings, clutches, shaft-mounted speed reducers, sprockets, etc. Plant production facilities include a gray iron foundry, which produces daily approximately 70 tons of castings varying in size from one-half ounce balance weights to 10-ton flywheels. There are also a large machine shop, a steel fabricating division and various assembly operations.

Dodge has had a statistical quality control program for the last six years, but prior to two years ago it was limited to the machining divisions. In November of 1951 it was decided to initiate a quality control program in the foundry.

While statistical quality control had been successfully used in all types of industries, there was a limited amount of published material on the subject of foundry quality control. After reading what material was available, and visiting some of the known installations, it was decided to use a statistical or charting approach to the problem of controlling and reducing scrap. This system would require no additional employees.

One of the major obstacles confronting anyone starting a foundry quality control program is the large number of variables. In machining divisions there is usually a reference made to the three "M's." These are the three variables—man, machine and materials. In foundry operations, however, there are many times three variables. To be able to analyze and control some of these variables is a primary aim of a foundry quality control program.

It seemed somewhat logical to start at the beginning of foundry operations—the charging of the cupola. In the Dodge foundry each of the raw materials that make up the total charge is weighed individually to control the analysis of the iron coming from the cupola. It is important that each raw material be weighed accurately. By reorganizing the personnel that made up the charging gang, one man was made available to serve as a group leader. It was his duty to see that all charges were made up correctly and to verify the weight of everything on the scales.

While records had always been kept of the results of the daily chemical analysis, it was decided that a graphic picture would be a better basis for making corrections. A large wall chart was made (Fig. 1). This shows graphically the daily average of total carbon, silicon, sulphur, tensile,

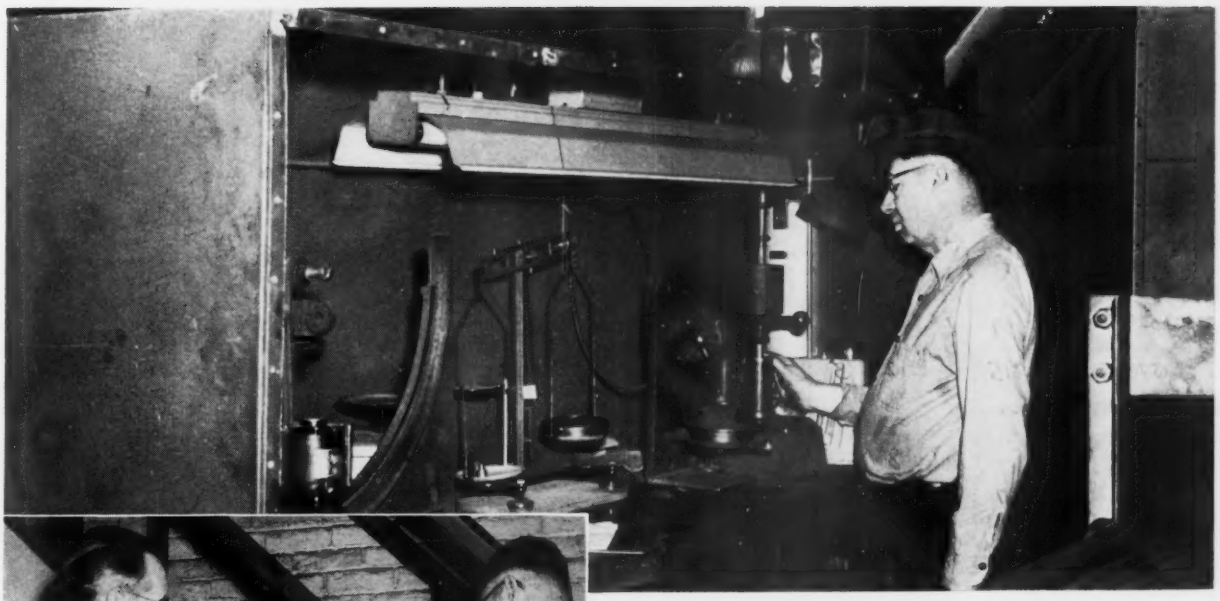


Fig. 2 (above)—Sand tester is ramming up sand sample with which to make test for permeability

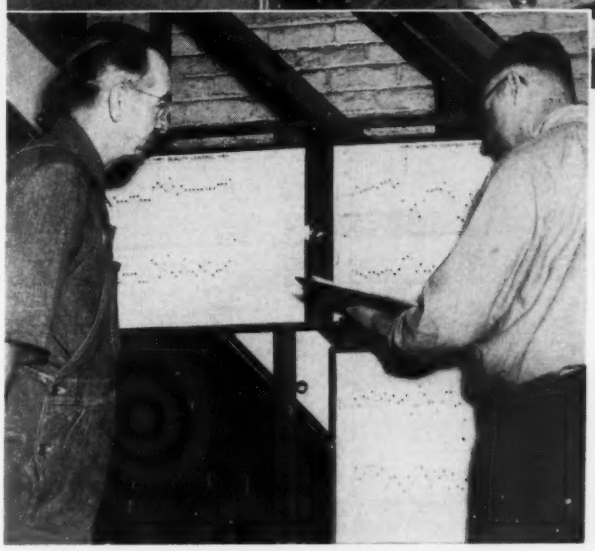


Fig. 3 (left)—Muller operator watches tester plotting control charts on sand characteristics

Fig. 4—Foremen are going over daily scrap to determine cause of the defect while the quality control engineer waits to record their decision

and brinell, and statistical limits were established for each of these. By the use of this graph it is possible to detect trends and cycles and take corrective action at the proper time.

The next variable to be studied was sand. There are three mullers making several types of sand. The sand is divided into three main types—unit, slinger and roll-over. The unit sand is that used in the mechanized unit; slinger sand is used in the sand slinger, and roll-over sand on roll-overs, pin-lifts and drop pattern equipment. It was decided to chart three of the main characteristics that were tested—moisture, permeability and green compression strength (Figs. 2 and 3). Limits were established for these charts and eight tests were plotted daily for each chart. By watching the charts and making corrections at the proper time, less variability in the sand mixture is obtained.

All records that had been kept on foundry scrap were based on tonnage, but it was believed that for a successful foundry quality control program it would be necessary to use pieces instead of tons. An attempt was made to match the good castings plus the bad castings with production schedules. It was found that they didn't match and were several per cent short each day. In order to have accurate scrap records it was necessary to reduce this shortage figure. There were three things that could contribute to this shortage:

1. Two days' heats mixed in the cleaning room.
2. Small castings actually lost in the sand.
3. Molder miscounting the number made.

By carefully studying the above three factors, and through the co-operation of all foundry departments, this figure was reduced to less than 1 per cent, where it has remained.

Next step was to chart individual molder scrap. A form was made (Fig. 5) which listed every molder, numbers of the patterns on which he worked that day, the good castings that passed over the scale and the castings that were scrapped. All scrap that is made each day is separated and

QUALITY CONTROL

Foundry Scrap Distribution Tally Sheet

Molder JOE SMITH Date JUNE 19 1954

Pattern's Symbol	Total Castings	Good Castings	Difference	Found	Error	Molder	Pouring				Cleaning			Sand	Cores	Shrinks	Shifted	Jackets	Shakeouts	Destroyed on Unit	Others			
							Shifting	Slag	Poured Short	Cold Iron	Broken	Cracked	Gates Broke								Shook Out Too Hot			
HA 329	210	209	1	1		1																		
AA 1523	330	315	15	12	3	2		2	2				1		2		2				1			
DA 1592	44	44																						
AA 712	78	70	8	8			1		2			2	2	1										
FA 693	69	67	2	1	1															1				
Total	731					3	1	2	4			2	3	1	2		2			1	1			

Total Cast	731	%
Total Scrap	22	3.0
Unaccounted	4	.54
Pouring	8	1.1

Revised 8-28-53

Fig. 5—Typical foundry scrap distribution tally sheet covers one day of work for one molder

Fig. 6—Cupola supervisor pours test bar to test tensile and brinell. Chart on wall (at right) shows average amount of flowability of the iron

placed on a large table (Fig. 4). Each piece of scrap is examined, the cause of the defect determined by the foundry foreman and this information recorded on the above-mentioned form by a quality control engineer. The per cent defective made by each molder is plotted daily on his control chart (Fig. 7). Each chart was placed on the wall adjacent to the molder's work station. After a chart had been constructed for every molder, a daily control chart was provided for the total foundry scrap. It is interesting to note that while this percentage is slightly under the per cent scrap by weight, both figures fluctuate approximately the same.

Approximately one-half of the daily scrap was attributed to pouring defects, so a control chart was constructed showing the per cent defective due to pouring defects.

Many records were now available for study and it was noticed that one of the causes for scrap was so-called "cold iron"; that is, molds that fail to fill up properly. Cores were made which when filled with iron would show the degree of fluidity of the iron. Six of these are poured daily and the average length of flow in inches is plotted on a control chart.

Many other average and range charts for use

Fig. 7 (above)—Molder and foreman are looking at the molder's daily percent defective chart

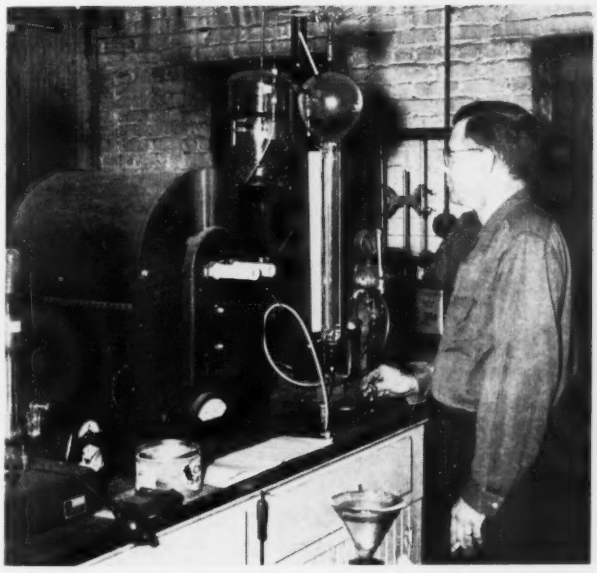


Fig. 8 (left)—In the foundry laboratory, the metallurgist tests a sample for carbon content

on specific problems have been made. Also, other techniques have been used, such as correlation, analysis variance, control charts, etc.

The immediate results of the quality control program at Dodge were to make all foundry personnel more quality conscious. This, plus continual effort of the foundry supervision, has resulted in a lower scrap figure.

Plans for the future include making an analysis of the pouring time and charting mold hardness. There will be, of course, many investigations made of specific scrap problems.

While statistical quality control can be and has been successfully used in most all types of manufacturing processes, the possibilities of its use in foundry operations are unlimited.

Fig. 9—Lab technician uses a tensile testing machine to test a sample of the iron each day

Solving Problems in the Brass Foundry

This is the second and concluding article in which the author discusses some of the problems encountered in casting copper-base alloys and suggests various remedies for overcoming them

ASSUME that some one person has been given the job of solving the problem of leaky tin bronze castings. How is he likely to proceed? Let us number the steps to be taken and then supply details as to the methods that may be used.

1. The pattern. The points to be noticed in this connection were outlined in last month's article.

2. From whom was the composition ingot purchased, and has the foundry's experience with this supplier been satisfactory? What is the appearance of the fracture of the ingots?

3. Are the test bar results up to the required standard, especially in regard to density?

4. How recently has the pyrometer been checked?

5. How many castings are poured from one ladle?

6. What percentage of castings are defective and upon what number is this percentage based?

7. Are defectives found in first or last molds poured or do they occur at random?

8. Do all leaks occur in the same area?

9. Is there any shrinkage at the leaky areas as indicated by examination of the fracture?

10. Is the trouble persistent from day to day and is it present in each heat of metal?

11. What chills are used and how many, where placed and of what size?

12. Are the same molders employed for all these castings? If more than one molder, can defectives be allocated to one more than to another?

13. Is there any change in the condition of the sand from one day to another? (This applies especially to the moisture content and ramming.)

14. If molds are made of dry sand, are they completely dry, and are cores dried uniformly?

15. Are molds poured horizontally, vertically, or at an angle?

Let us now assume that the one responsible for this investigation has become acquainted with the answers to the questions. He may then proceed along the following lines:

1. Pattern. (Already discussed.)

2. If the fracture of the ingots gives ground for suspicion as to metal quality, it is a good thing to order enough metal from another ingot maker to allow for the making of the large number of castings that the investigation may require. In placing the order it should be understood that all the metal is to be from one heat, all molten at the same time.

3. If the test bar results are erratic, especially in regard to density and elongation, the melting process may have been at fault. If the results are consistently low, it may be the fault of the ingot metal, or of course it may be due to a uniformly poor melting practice. (A thorough study of the entire melting practice should be made.)

4. The pyrometer should be rechecked in any case against sodium chloride.

5. This requires only a statement of fact.

6. This information is asked for because if the percentage defective figure is high, it suggests a problem of less complication than if there are only a few, as the cause is likely to be basic, such as metal or sand. If the percentage is low, more difficulty will probably be experienced and possibly several operations will be involved.

7. If the first molds are the ones to give defectives, look for too high a pouring temperature; if the last, a pouring temperature that is too low at the start, or it may be that too many molds are being cast for the safe temperature range to accommodate them. If the defectives occur at random, the pouring temperature is probably not the cause of the trouble.

8. If the leaks all occur in the same area look for shrinkage as the cause with the possibility that it may be overcome by chills and/or risers. (It may help to examine the area microscopically to look for micro-shrinkage, which, if present suggests interdendritic shrinkage or gas or both.)

9. If shrinkage is visible by ordinary observation and shows voids and/or discoloration, chills are the most likely remedy if they can be applied practically.

10. This ties up with the high percentage of defectives, as shown in item 6, and if trouble is persistent suggests some basic cause.

11. This information regarding chills forms the

By HAROLD J. ROAST
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starting point for suggested improvements in items 8 and 9.

12. The answer to item 12 is obvious. If there is evidence that one molder's work is worse than others, change the molder.

13. The sand control reports will furnish information as to the condition of the sand; the moisture content, in the case of green sand, is the most important. For natural bonded sand moisture should not exceed 6 per cent. For synthetic sand possibly 3 or 4 per cent. Ramming figure is also important.

14. The question of dryness of the molds and cores should be answered by making actual moisture tests.

15. Whether the molds should be poured horizontally or otherwise is one of the last changes to be tried, but sometimes it is the deciding factor.

Trouble with Pressure Work— Tin bronzes, on account of their wide temperature range during which solidification occurs, are notoriously difficult to handle for pressure work. If the choice of alloy rests with the foundry, it may be wise to try another alloy having a shorter solidification range. This might be silicon bronze or one better suited to pressure work, such as a high-leaded tin bronze, with some 15 per cent of lead; or an alloy of practically no solidification range at all, such as aluminum bronze; or one that has only a very slight tendency to gas, such as manganese bronze. The choice depends, of course, on other characteristics besides solidification range, such as resistance to corrosion and other qualities, and the final decision will be based on the best average qualities that the alloy is to possess.

Troubles in the nonferrous foundry are often very specific both as to the difficulty and the remedy. For example, one of the troubles associated with manganese bronze is the dross which forms during pouring and which lodges here and there in the casting. The remedy is to avoid turbulence, and this is accomplished by using step gates to break the force of the impact of the molten metal as it enters the mold. Top pouring is to be avoided.

Care must be taken to see that the entry of the molten metal to the casting proper is larger than the sprue and runner in order that any squirting effect may be avoided. In this connection the horn gate, if used, must be inverted. All edges over which the metal has to run should be rounded and all fillets should be generous. The lower the pouring temperature the better, provided the mold fills readily.

Manganese bronze is one alloy which does not really require a pyrometer to give the correct pouring temperature. The molten metal itself will do this if a skimmer is (*Please turn to page* 258)

ADOPTS MINIMUM STANDARD

For Steel Castings

A RECOMMENDED MINIMUM STANDARD for commercial carbon steel castings has been adopted by the Steel Founders' Society of America. This is the first minimum standard in the century-long history of the steel casting industry.

This standard is the outgrowth of studies made by the society's Product Development Committee and subsequent recommendations calling for its development. Succeeding work and ultimate drafting became the task of the Specifications Committee. Thorough discussion in each of the eight society divisions throughout the country focused the practical technology of the entire society's membership into the standard's final composition.

Acceptance Voluntary — Acceptance of the standard will be voluntary on the part of both the customer and the steel foundry supplying the castings. It is not expected, nor is it intended, that it displace other specifications now in use. It does, however, give a firmer basis by means of which the purchaser and also the supplier of commercial cast steel components can arrive at a common understanding. It represents a commonsense approach to a fuller use of the properties inherent in cast carbon and low alloy steel. By issuing this standard the Steel Founders' Society of America goes on record as advocating the purchase and sale of steel castings in a preferable physical and metallurgical condition.

Quality control procedures, primarily affecting physical and chemical properties, will govern production of steel casting under conditions set forth in the Recommended Minimum Standard. Control of these properties implies a need for similar techniques in the selection of raw materials and the processing steps through the melting and heat treating cycles.

Heat Treatment Stressed—Heat treatment of

Reproduced at right is the recommended minimum standard adopted for commercial cast carbon steel

Recommended Minimum Standard for Commercial Carbon Steel Castings . . .

adopted by STEEL FOUNDERS' SOCIETY OF AMERICA

This recommended minimum standard is applicable to steel castings commonly referred to as "commercial carbon steel castings" (readily weldable grade).

This minimum standard shall apply only when no customer specification, calling for another order of quality, is made a part of an order.

It cannot be too strongly emphasized that the requirements of this standard are suggested minimums, and that they are not intended to influence in any way the production of castings which are improvements on these minimums.

It is the intent of this recommended minimum standard that all clauses apply unless otherwise agreed upon by producer and customer.

A—Material and Workmanship

A-1. The castings shall, as determined by visual examination, be free from cracks, shrinkage cavities, hot tears, swells, scabs, blowholes and pinhole porosity, that impair the utility of the castings.

A-2. Castings shall be free from sand and scale on all surfaces to the extent that normal machining operations can be performed without the necessity for further cleaning by the customer.

B—Detail Requirements

B-1. Castings shall have gates and risers removed in such a manner that no riser or gate stub projects beyond the casting design contour in an amount that would exceed the following values:

Riser or Gate Maximum Dimension inches	Maximum Projection inches
Up to 4	1/8
4 — to 8	1/4
8 — to 20	3/8
20 — to 30	1/2
Over 30	3/4

B-2. The removal of gates and risers shall not produce depressions which are more than 1/8" below the casting design surface, except that for castings having risers greater than 20" maximum dimension the depression shall not be more than 1/4" below the casting design surface.

B-3. The responsibility for furnishing castings that can be laid out and machined to the finished dimensions, within the tolerances given and without further straightening by the customer, shall rest with the foundry only if both a pattern and drawings are furnished. If the foundry is furnished a pattern without accompanying drawings, the foundry fulfills its responsibility as to casting dimensions by furnishing castings which are true to the pattern.

B-4. Castings shall be within a weight limit of +5 or −5 percent.

C—Heat Treatment

C-1. Pyrometric equipment shall be used to enable the heat-treating procedures given in C-2 to C-4 to be satisfactorily carried out. Pyrometric equipment shall be maintained in accurate condition at all times. Checks for accuracy shall be made at least once each 30 days.

C-2. Castings shall be heat-treated by one of the following three methods at the option of the manufacturer:

(a) Full Annealing

(b) Normalizing

(c) Normalizing and tempering (stress relieving)

C-3. *Heating.* Regardless of the heat treatment employed, the castings shall be uniformly heated to a temperature above the transformation temperature and shall be held at this temperature for a sufficient length of time to refine the grain. The temperature difference between the hottest and coolest part of the charge during the holding period shall not be greater than 75° F. (See Note A.)

C-4. *Cooling.* The castings shall be cooled as follows:

(a) Full Annealing. Castings shall be cooled slowly in a closed furnace from the annealing temperature. When the temperature of the furnace has fallen to 1000 degrees the castings may be removed and cooled in air.

(b) Normalizing. The castings shall be removed from the furnace and cooled in air.

(c) Tempering (stress relieving). Castings shall be heated to a temperature below the lower critical and held at this temperature for not less than one hour. After the heating period the castings may be furnace cooled or removed from the furnace and cooled in air.

For the first time in the industry's history a minimum standard has been adopted for steel castings. It results from action taken by the Steel Founders' Society of America. The standard is not intended to supplant existing specifications, and its acceptance will be voluntary on the part of both the buyer and seller

steel castings is emphasized. Research reports and literature issued by the Steel Founders' Society have identified the improved design properties achieved by heat treatment. Research Report No. 27 shows that heat treatment improves the machining characteristics of cast steel, an important factor in the cost of metal components.

During the development of the Recommended Minimum Standard several foundries adopted the practices advocated as a basis for their own operations. There will be applications and production, however, where the quality level set forth in this standard is not required. It must be emphasized that the use of the standard is a matter of voluntary agreement between the foundry supplying the steel casting and the buyer.

The adoption of the Recommended Minimum Standard is a natural and logical outgrowth of activities within the Steel Founders' Society. Today, some thirty research projects sponsored by the society are published and available to its members. Some portions of these are supplied to customer industries as guides in the use of steel castings. Twelve additional projects are under way and others are contemplated. All of these are directed toward the improvement of steel casting production methods and the metallurgical and physical properties of the various carbon and low alloy cast steels.

Technical and operating conferences in each of the eight divisions of the society are continuously developing the use of information coming out of this research program, as well as providing a medium of free exchange for operating and technical ideas among the steel foundries in a given area. The ninth national Technical & Operating Conference will be held this fall on Nov. 3-5, in Cleveland.

Paralleling these activities is a product development program designed to discover new steel casting applications and improve the design of cast steel components. Among the duties of the Product Development Committee are the promotion of casting quality, design, and new products.

The Recommended Minimum Standard becomes one of the first steps in a marketing program now under development within the Steel Founders' Society of America. Quality, dependability, and reliability are marketing instruments in themselves. Improved physical and chemical properties constitute another market improving device. The adopted standard promotes these factors.

Copies of the Recommended Minimum Standard, as well as a booklet on the "Machinability of Cast Steels" are available free upon request to the Steel Founders' Society of America, 920 Midland Building, Cleveland 15.

D—Repair of Defects

D-1. The welding of steel castings, whether for repair of defects or addition of other structures, is permitted at any point in their processing provided the following conditions are complied with:

(a) The defect shall be thoroughly and completely removed.

(b) The area to be welded shall be clean and free from sand and scale or other extraneous material.

(c) The welding shall be performed in accordance with the procedures stipulated in the SFSA Recommended Practice for the Welding of Steel Castings.

NOTE A: For information on the transformation temperature for commercial carbon steel castings see Fig. 285, page 209 in the Steel Castings Handbook, 1950 Edition.

E—Methods of Sampling, Inspection and Tests

E-1. All castings shall be surface inspected for defects and surface appearance after final cleaning for shipment.

E-2. Representative castings from each order or lot shall be inspected for adherence to tolerances.

E-3. It is recommended that for castings in lots of 50 or more and, if practical, castings should be inspected by destructive or non-destructive tests to ascertain whether they are as sound as ASTM Radiographic Standards, E-71, Class 1.

E-4. One tension test shall be made from each heat in each lot. The design of such test coupons shall be the Standard ASTM Test Coupon illustrated in ASTM Tentative Methods and Definitions A370-53T (Mechanical Testing of Steel Products). If any test specimen shows defective machining or develops flaws, it may be discarded and another specimen substituted from the same lot. The term "lot" shall be considered as all castings in a heat subjected to the same heat-treating procedure. After meeting acceptance tests for ten consecutive heats used for making castings of any one grade, the manufacturer may assemble the castings from succeeding melts in groups of five heats each. The castings in each such group shall be accepted on the basis of one test specimen taken from every fifth heat, provided that the chemical analysis of all the heats in the group falls within the range established by the first ten consecutive acceptable heats and all subsequent heats that are physically tested and found acceptable. If this test fails, the heat may be requalified by using another specimen, and the four other heats in the group shall be tested individually. The same heat-treating procedure used for the first ten consecutive heats shall be used for all subsequent heats. This procedure shall be established for each grade separately.

E-5. In cases where more than one heat is poured into a ladle (teeming of several heats), the heat shall be deemed to be the ladle from which the castings are finally poured.

E-6. The coupon, for mechanical test specimens, shall be poured with metal which has received deoxidation treatment identical to that metal from which the castings are poured.

E-7. One tension-test specimen from each lot (as qualified in paragraph E-1) shall be tested and shall meet the minimum properties noted in Table I.

E-8. When any test specimen shows defective machining or obvious lack of continuity of metal, it may be discarded and replaced by another specimen from the same lot.

E-9. In the event two test specimens from any lot fail to meet the minimum requirements noted in Table I, the castings may be re-heat-treated as often as desired with a coupon from the same heat.

E-10. Chemical analysis of each heat shall be made to determine acceptance as noted in Table I. Drillings for chemical analysis may be taken from broken test specimens, castings poured in the heat or from a separate block representing the melt. (See Note B)

NOTE B: The alloying elements Mo, Cu, Ni and Cr need not be determined by analysis on every heat, but it is recommended that they be determined at intervals.

TABLE I

Chemical and Mechanical Property Requirements

Chemical Composition—Maximum percent

C*	Mn*	Si	P	S	Mo**	Cu**	Ni**	Cr**
.33	.70	.80	.06	.06	.20	.50	.50	.25

For each reduction of .01 percent carbon under the maximum specified, an increase of .04 percent manganese above the maximum specified will be permitted.

Minimum silicon permitted is .25 percent.

Total content of these unspecified elements shall not exceed 1.00 percent.

Mechanical Properties*

Tensile Strength Minimum psi	Yield Point Minimum psi	Elongation in 2 inches % Minimum	Reduction in area % Minimum
60,000	30,000	24	35

Mechanical properties shall be determined on the standard 0.505 inch diameter tensile test bar, either with or without threaded ends.

STEEL FOUNDERS' SOCIETY OF AMERICA
920 MIDLAND BLDG. CLEVELAND 15, OHIO

QUESTIONS

Shell mold leaves deposit on casting . . . . . .

Tubes cut by metal . . . . . Stack molding trouble

Castings are spongy . . . . . Chill cast gears

Carbon Deposits on Fittings

QUESTION We are casting brass fittings using the shell molding process and have had very satisfactory results except for one thing. The brass castings come out of the burned sand shell with a black coating. It looks as if this coating is a carbon deposit which comes from the burned resin. We would like to eliminate this dark color. How can we do it?

ANSWER The black or, more commonly, gray coating which appears on shell mold castings is due to a carbon deposit left from the burned resin. There are two possible ways in which you might attempt to get rid of this coating that may entail some loss of dimensional accuracy. You could try coating the shell with a conventional core wash or sand blast the castings after shakeout. Assuming that you want to avoid any loss of dimensional accuracy, you could first wash the castings in strong lye solution and then dip them in chromic acid.

Molten Metal Cuts Steel Tube

QUESTION We will appreciate your comments on a satisfactory steel tubing ⅜ to 7/16-in. diam with 1/16 in. or less wall thickness which we can place in a horseshoe shaped copper casting. Face of casting is about ¾ x 3 in. We have tried seamless tubing recommended by a steel company, but it seemed to split in one or two places inside the casting. We filled the tube with coarse white sand, and the copper was poured at 2300° F.

ANSWER Your difficulty with the steel tubing is due to cutting rather than splitting, caused by the molten metal impinging directly on the tubing or flowing over it for too long a period. You do not mention how the casting is gated, but it may be that you are only using two gates and that the molten copper impinges on the tubing long enough to cut through the wall.

Remedy, of course, is to increase the number of gates or arrange them so that no impingement occurs. Another method would be to coat the tubing at the particular areas involved with a refractory wash, but that would have to be done carefully so that the coating would not flake or peel off, causing trouble at some other point. A heavier tube might eliminate the difficulty, but apparently that change cannot be made.

We also suggest that you try pouring the copper at a lower temperature. We believe that you should obtain solid castings of ¾-in. thickness with a temperature of 2150° F, and possibly reduction of the pouring temperature to around that point will eliminate the cutting of the tube.

Difficulty in Stack Molding

QUESTION We would like to produce in our iron foundry in the Netherlands flat castings such as stove rings and covers by the stack molding method. We are using French molding machines with a flask size of about 15 x 20 in., and do not want to use extra pattern plates. With this method we have the following difficulties: Between many of the pattern plates and flask there is only a distance of 2 to 3 cm or 0.5 to 0.75-in., and the flasks easily empty during casting. In squeezing the flask the sand runs out at the top. We have tried using a squeeze frame, but it did not work properly. Another disadvantage was that the sand at the top edge of the flask was not steady or compact enough. Could you give us some practical hints?

ANSWER If we interpret your statements correctly we gather that one of your troubles is due to "runouts"—the metal flows out through the joint between the mold sections. One of the reasons for this is the extremely narrow band of sand between the edge of the pattern and the flask; you indicate it to be ½ to ¾-in. That hardly is enough, but under the circumstances there doesn't seem to be much that can be done about it since the remedy would be a larger flask. Possibly the trouble may be due to a lack of parallelity between the faces of the two molds at the joint which prevents intimate contact of the sand, particularly in the area all around the outer edges.

A possible remedy would be to allow what is termed a "crush" on one face of the mold. This means the sand is allowed to project a slight distance above the edges of the flask. In your case it can be accomplished in striking off the top or flat side of the mold with a contoured strike which when resting on the flask edges permits the sand to project up about 1/16-in. higher than the flask.

Another possible cause of the runouts, based on your remarks about the sand not being compact enough with reference to use of a frame, is that the sand around the edges is not compressed or rammed sufficiently in the squeezing operation. This could be overcome by using a contoured squeeze board. We assume that the present squeeze board on the head of the machine has dimensions slightly smaller than the inside measurements of the flask. Placing strips along the outer edges of the face of the squeeze board will permit greater pressure to be exerted at the outer edges, and hence compress the sand more under the particular areas involved.

However, with such a board a sand frame will have to be used so that the sand can be struck off level and smooth to provide the proper joint. We do not quite understand what you mean by the sand frame not working properly. It may be that we are talking about different things. The frame we have in mind fits on top of the flask and has the same interior dimensions. In your case where it is desired to hold the sand in specific confines, it may be advisable either to place corner brackets on the frame to engage the flask corners, or to extend the pins on the mold-

ing machine platen high enough to engage suitably placed holes in the frame. Either method will insure proper location of frame in relation to the flask.

Height of the sand frame may be any desired value, but preferably it should not be any higher than just to leave enough sand for a smooth strike off after the squeezing operation. That of course, will have to be determined by experiment, and it is possible to set the height so that no strike-off is needed.

Has Trouble with Core Mixes

QUESTION We would like to have your suggestions on core sand mixes for aluminum castings. We have tried a number of compounds which have been recommended, and some have worked out well except that they have a tendency to stick to the coreboxes. We also have tried oil sand mixes, but if the core is soft enough to break down for shakeout, it will not hold up for handling. We are using lake sand which is mixed in a small, muller-type machine.

ANSWER It seems rather odd that you are having so much difficulty with developing suitable cores, and it occurs to us that perhaps directions on compounding the mixes are not being followed to the letter. While those are not necessarily critical, they should be followed as closely as possible since variations in amounts of some of the ingredients will be a source of trouble. Also attention is directed to use of battered-up measuring devices and dirty coreboxes. For example, excess moisture often causes sticking in coreboxes. However, since you do not mention specifically what mixtures have been tried, we cannot offer any suggestions on possible remedies.

As far as specific mixtures are concerned, you might try the following suggested by a large operator for large and small cores requiring smooth surface, moderate green strength and high permeability. Oil content is varied to obtain the required dry strength. The mixture is composed of 800 lb silica sand, 200 lb bank sand, 8 lb cereal flour, 4 to 9¾ lb core oil, 41¾ lb water and 3½ lb kerosine. You also might try urea resin binder using 1000 lb silica sand, 12 lb cereal, 11½ lb urea binder, 27 lb water, and 4 lb kerosine.

Sponginess in Brass Castings

QUESTION We are unable to eliminate sponginess in some of our brass castings. This condition does not always appear on the same castings, and seems to be spotty rather than consistent. We are sending you a casting to give you an idea of the appearance of the trouble. The porosity appears on the cope side.

ANSWER To us your trouble seems to be gases absorbed during melting, and more attention to

Holes prominent on heavy section

that phase undoubtedly will correct the trouble. As you have observed, the holes are larger and more prevalent in the heavy section, and do not show up until a machine cut is taken. This is due to the fact that the thinner sections which cool more rapidly tend to hold the gas in solution in the form of very finely dispersed holes. In the heavier portion which remains molten longer the gases collect into larger bubbles and travel up trying to escape. However, the thin solid skin formed at the mold wall prevents that, and the bubbles or porous areas are found just under the skin.

Mold and Chill Information

QUESTION With reference to an article on page 212 of the August issue it is not clear to us how three men produce 850 flasks or molds per day. Are only three molders employed in producing that amount? Last paragraph of the article mentions a molder completing 200 molds on an 8-hr shift, and with the new method 20 per cent more per man per day are obtained which would give a total of 240. We will appreciate an explanation of this. Also we would like to have any information on chilled gears such as type of chill used, what it is made of, how it is handled, is it smoked or coated, and is it heated?

ANSWER The reference to a molder producing 200 molds per day by previous practice meant the molder used a double-face matchplate to make both cope and drag and set his own cores. With that practice three molders would produce 600 molds a day. With the new set-up with one molding machine producing drags, another making copes and the third man setting cores, production was increased to 750 molds on the 40 casting-40 core set-up, and 850 molds on the 8 casting-8 core set-up. Thus the increase with the three-man combination actually was greater than the 20 per cent indicated—600 molds for three individual molders compared with 750 molds for the combination. Difference between the 750-mold rate and the 850-mold rate is in the number of cores set—40 as compared to 8 per mold.

As regards casting gears in chills, it might be pointed out that it is done to obtain a denser structure. Sand cast high-tin bronzes rarely are free from interdendritic porosity when machined to form gears. A number of ways of using chills on gear blanks have been used, and while none is completely satisfactory, the results have been acceptable to consumers of gears.

For the most part cast iron chills

are satisfactory, and common method is to use segmented chills completely enclosing the outside circumference. This tends to increase the depth of the dense casting skin which reduces the amount of interdendritic porosity found on machining. No generalities can be made on handling the chills. Usually they are rammed up in the mold and heated by a torch prior to filling the mold. While it is possible to pour against a cold chill, there is considerable danger of blowing unless adequate precautions are taken. The chill usually is heated to a temperature higher than just required to dry it, to control the action; the hotter the chill, the less its effect as a cooling medium. Best temperature is determined by experiment.

In some foundries chills are smoked while in others proprietary coatings are employed. Problem is largely one of preventing blowing and there appears no general agreement on the most suitable procedure. Too liberal application of coatings to chills may reduce the effectiveness since the coatings may function as insulators. Hence, coating should only be thick enough to prevent sticking or welding.

Techniques suggested to eliminate blowing when casting against a cold chill include serrating the chill surface, drilling holes in them and filling with core sand, and separating the chills with thin areas of sand. Usual method, as mentioned earlier, is to heat them. Gating of gear blanks is important, and gates and risers should be placed so that the metal flows *to* and not *over* the chills. Also efforts should be made to avoid disturbing the desired temperature gradient when it is established—that is, mixing of hot metal with metal either cooling or solidified should be minimized by careful placement of the in-gates.

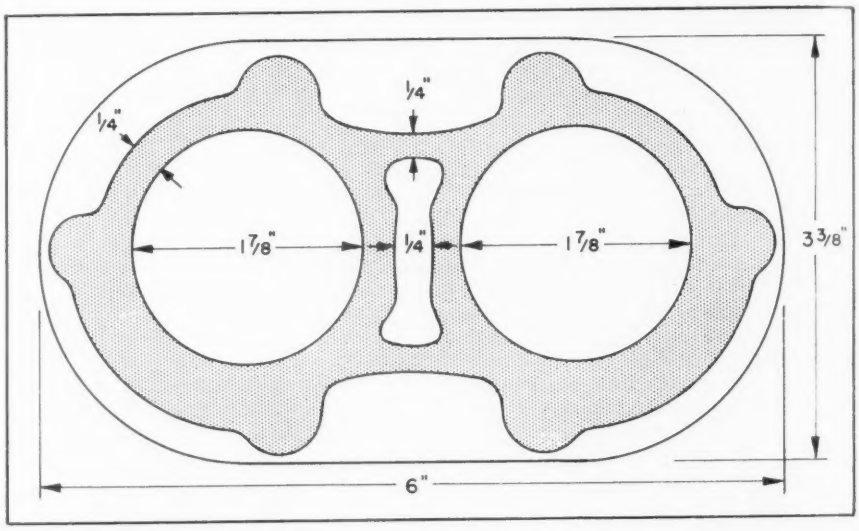
Specifies the Microstructure

QUESTION Enclosed is a drawing of a small cylinder block which we are making. Casting weight is 9 pounds. We wish to make iron for these castings that shows the following microstructure: Predominantly type A graphite, size 4-6 with no type B, D or E. It shall have less than 10 per cent free ferrite and no free cementite. At present our iron has the following analysis: Total carbon 3.41, silicon 2.25, manganese 0.65, combined carbon 0.52, phosphorus 0.16, and sulphur 0.11. We pour at a temperature of 2680° F and use no ladle additions. Our mix consists of 32 per cent pig iron, 16 per cent steel scrap and balance remelt and purchased cast scrap. We will appreciate any suggestions you may have which will help us produce this desired microstructure. Our customer is taking test samples from sections between the cylinder bores.

ANSWER Many factors influence graphite flake size and distribution and the amount of ferrite or cementite present. For this reason an exact outline of procedure to attain the results that you desire cannot be given. The factors which influence microstructure include metal composition, pouring temperature, use of inoculants, section size and cooling rate.

The analysis that you give for your iron should form a good starting place for experimentation to obtain the microstructure that is required. We suggest that you pour trial castings using the analysis given. After examining the microstructure you will know in what direction to proceed. If you have trouble in maintaining type A graphite we suggest the use of inoculants.

Should there be an excess of free ferrite present, faster shakeout or a reduction of the carbon equivalent should be tried. If cementite appears, leaving the castings in the mold longer, a higher carbon equivalent or the use of inoculants should be tried. It will be important to change only one variable at a time to ascertain its effect.



Purchaser requires that castings meet microstructure specifications

Has Trouble with Rat Tailing

QUESTION We are experiencing some difficulty with our stoveplate work. Some work made on the floor with wood roll up flasks gives good results. However, on slip flask work we have to make harder molds and pour faster, due to more molds, with the result that the molds scar and rat tail—soft molds wash. Present sand has an average grain fineness of 150, green strength 4.5 psi max permeability 25 to 28, and clay 13 per cent. We do not want to use facing sand. Is there a natural sand with high permeability and bond which would eliminate the trouble?

ANSWER With reference to your present sand, your trouble with rat-tailing due to sand expansion apparently could be overcome by increasing the green compression strength; it seems quite low and preferably should be from 6 to 9 psi. Green strength can be increased by addition of bonding clay or bentonite. We believe your difficulty arises from that source since the sand has to be rammed harder, and probably the moisture is higher than necessary to give it the proper workability or "feel."

Fine sands tend to rat tail if rammed hard since that decreases pore space and leaves no room for sand expansion. If your sand had a more suitable green strength as indicated, the difficulty might be

(*Concluded on page* 138)

1.—Eliminate costly hand labor in casting removal and sand conditioning

2.—Mechanize your night crew operation now with equipment that will fit into your plans for future growth

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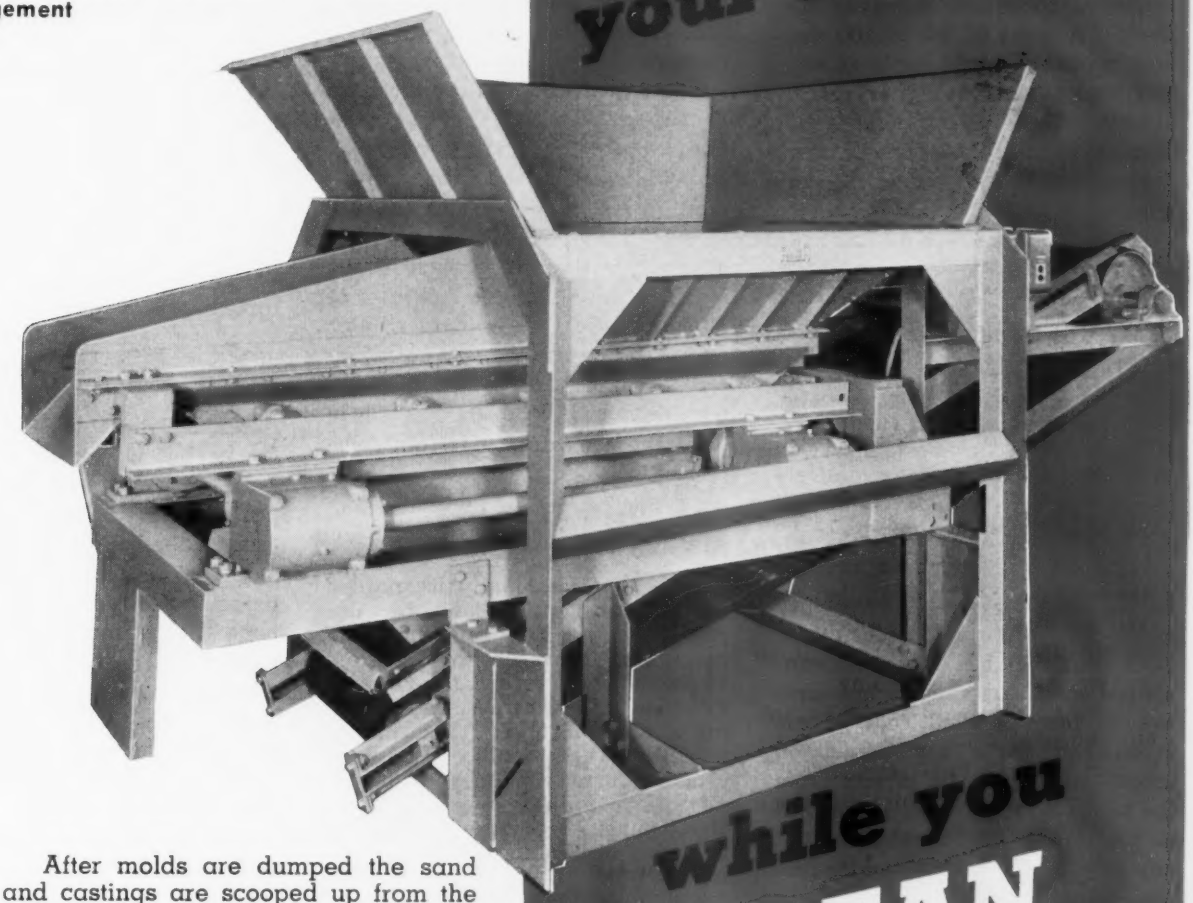

while you CLEAN your sand

with another ROYER First—
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After molds are dumped the sand and castings are scooped up from the molding floor by front end loaders and charged into the large hopper of the Royer Scrap Control; castings are discharged at one end at a height suitable for feeding a table or conveyor where they can be sprued and sorted. Up to 60 tons per hour of magnetically cleaned sand is discharged at the opposite end. High sand discharge allows related equipment to be above floor level.

This efficient machine can be operated as a complete system in itself or can discharge to a muller skip hoist, conveyor belt of a sand handling system or directly into a Royer Sand Separator and Blender for complete sand conditioning.

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(*Concluded from page* 136)
overcome by adding some combustible matter such as cereal, wood flour, seacoal or other additive which would burn out during contact with the hot metal, and leave room for the sand to expand without deforming the surface.

Your sand appears rather fine for gray iron, but presumably it is employed to obtain smoother surfaces. A sand of 90 to 100 fineness probably would serve as well, and would have a higher permeability. There is no doubt that suitable natural molding sands are available for stoveplate work, and your own sand supplier should be able to advise you. If not then try another one.

Wants a Strong Core Mixture

QUESTION We wonder if you can help us in any way with our current foundry problem which is: What sand mixture will blow well in a coreblowing machine and result in cores that are strong enough to be picked up by hand and be placed on a tray before baking?

ANSWER The only possibility which we can think of which might meet your requirements is a resin-bonded sand blown into a hot corebox to form a shell core. Some green-sand cores are blown on arbors which can be picked from the boxes by the arbors and placed in the molds, but we believe that any of the usual core sand mixes possessing sufficient green strength to be handled in that manner would in foundry parlance "be as hard as a brick" and cause considerable difficulty in removal from the casting.

Malleable Has Pearlitic Rim

QUESTION In our foundry in Japan we are producing blackheart malleable iron, and would like to know the cause of pearlitic rim and how to eliminate it. We use the duplex process with one cupola and two electric arc furnaces — one basic lined and the other acid. Raw materials are mild steel scrap, hard iron returns and a small amount of annealed iron scrap. No pig is used. Tapping temperature is about 2900° F and 0.01 per cent Al is added to each ladle. Hard iron shows 2.6 per cent TC, 1.0 per cent Si, 0.3 per cent Mn, 0.05 per cent P, 0.08 per cent S and 0.035 per cent Cr. Annealing furnace is tunnel type, oil-fired, and maximum temperature is 1652° F with a heat treating cycle of 112 hr. Annealing pots are packed with coarse sand. Mechanical properties are 54,000 psi tensile and 16 per cent elongation on a 0.55-in. diam specimen.

ANSWER Formation of pearlitic rims on malleable may be due to a number of causes, including presence of carbide stabilizing elements, excessive surface decarburization, rapid raising to temperature, faulty Mn to S or Si to C ratios, and high N content. We note that you mention a chromium content of 0.035, and we suspect that the trouble may lie in the presence of that element since indications are that difficulty will occur when Cr is over the value given. Addition of Al is claimed to eliminate trouble with high nitrogen, but for counteracting the effect of Cr, boron additions between 0.001 and 0.0015 per cent are said to be quite effective.

Melting Steel in a Crucible

QUESTION Occasionally we need a carbon steel gear blank for use with some of the equipment we make, and it has been our custom to purchase it. Now that our foundry production is low we are wondering if we could make these blanks —melting the steel in our oil-fired crucible furnace. Can you give us any information on melting steel in this manner? We are not interested in gating or molding—only in melting.

ANSWER If you have an efficient oil-fired crucible furnace which develops high temperatures, it is possible to melt steel and pour it into castings. Since the steel scrap during melting will absorb from 0.20 to 0.40 per cent carbon from the graphite crucible, it is necessary to use a clay pot or crucible, or line the graphite crucible with a refractory clay coating ¼-in. thick. While you mention plain carbon steel as the material, you do not state the composition. Presumably you will use the medium carbon which is most commonly employed, and shows about 0.30 per cent C, 0.70 per cent Mn, 0.80 per cent Si max., 0.06 per cent S max, and 0.05 per cent P max.

With the maximums on P and S, it is necessary to know the composition of the raw materials used so adjustments can be made to produce steel within the desired limits. For example, boiler plate may have the following range: 0.15 to 0.35 C, 0.60 to 0.80 Mn, 0.035 to 0.05 P, 0.04 to 0.05 S and 0.15 to 0.20 Si. By careful selection of scrap with low P and S, it will be possible to produce the desired steel, but due to melting loss and possible pickup of S from the fuel, the P and S tend to increase. Hence, it may be advisable to have on hand some ingot iron scrap which is low in all elements, to make suitable adjustments.

Crucible containing the steel is covered during melting, and that period will take about 4 hr or more. Progress of melting and bringing to temperature usually is followed by pushing back the crucible cover and inserting a steel rod or poker to the bottom of the crucible. When the steel first is melted it "boils" freely, but is cold as indicated by some of the steel sticking to the poker. As the temperature increases the boil gradually subsides, and less and less of the bath adheres to the rod. Eventually when none of the molten steel adheres to the poker or rod, and the bath is quiet, the steel is hot enough to pour. Bath then is deoxidized by adding the proper amounts of ferrosilicon and ferromanganese in envelopes. Envelopes containing ferroalloys should be thrown in with sufficient force to insure penetration of the thin coat of slag.

Since the Si in the steel can run up to 0.80 per cent, you can add 10 or 12 oz of 50 per cent ferrosilicon per 100 lb of steel which, with a 0.20 per cent Si as charged, will result in a content of 0.50 per cent in the bath. For addition of ferromanganese one should know the loss during melting, but possibly you could add 2 to 4 oz of ferromanganese per 100 lb steel; this would raise the Mn content 0.16 to 0.20 per cent. Alloys are stirred into the melt. About 5 minutes after the addition the pot is pulled, the slag quickly skimmed from the surface with a steel rod, and the metal poured. Delay between pulling and pouring should be as short as possible since temperature drops rapidly. Any slag on the surface is held back at the lip with the steel rod.

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2. Electrode control permits adjusting to the physical variances of cores.

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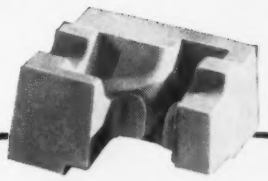

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MEN OF INDUSTRY

JOHN W. BOLTON
. . . retired research director

MARVIN L. STEINBUCH
. . . new director of research

PAUL W. VANDENBERG
. . . heads Castings Branch

H. B. PLUNKETT
. . . executive vice president

JOHN W. BOLTON has retired as director, Metallurgical Research and Testing Division, Lunkenheimer Co., Cincinnati, because of ill health. He has been succeeded by **Marvin L. Steinbuch,** formerly assistant director. Mr. Bolton received his master's degree in science in 1921 from Rose Polytechnic Institute, and joined Lunkenheimer Co. in 1926 as chief metallurgist. He became research head in 1927. Active in American Foundrymen's Society, which awarded him the John A. Penton Gold Medal in 1937, honoring his research publications, he has served on advisory and research committees of various technical groups. For many years Mr. Bolton has been a member of FOUNDRY's advisory staff. Mr. Steinbuch received his master's degree in science from University of Cincinnati in 1947, when he joined Lunkenheimer's research division. He became departmental head of structural metallurgy in 1952.

♦ ♦ ♦

J. R. Allan, who recently retired as manager of the industrial engineering and construction department, International Harvester Co., Chicago, as reported in August FOUNDRY, has formed Allan Industries Inc. As president, Mr. Allan will operate from Melbourne, Fla., offering consulting service in foundry, manufacturing, industrial, construction, air pollution, and industrial safety problems.

♦ ♦ ♦

Frank A. McBrearity has been named Philadelphia manager, Industrial Rubber Products Division, Raybestos-Manhattan Inc., Passaic, N. J., succeeding **G. R. Van Duser. Howard W. Smith** has succeeded Mr. McBrearity as sales representative for the central New York area.

Paul W. Vandenberg of Crane Co., Chicago, has been named chief of the Castings Branch, Iron and Steel Division of the Business and Defense Services Administration. The BDSA is a section of the Department of Commerce. He will hold the post for six months. Mr. Vandenberg is manager of Crane's equipment manufacturers sales section at the company's general office in Chicago. A veteran of 27 years with Crane Co., Mr. Vandenberg has been director of the company's heating engineering department, manager of the heating sales department and manager of general industrial sales in addition to other positions.

♦ ♦ ♦

Frank C. Riecks, formerly project manager, plant engineering, Ford Motor Co.'s central staff, recently became technical assistant to the manager of foundries, engine and foundries division. With Ford since 1916, he has worked on many of the company's construction programs here and abroad, including the new Cleveland foundry. **Harry E. Gravlin,** until recently production manager of the Dearborn Iron Foundry, has been appointed general production superintendent, Lincoln-Mercury assembly plant, Wayne, Mich. Mr. Gravlin, who joined the company 15 years ago, has served in the engineering and production departments and main laboratories.

♦ ♦ ♦

Paul R. Simon has been appointed general manager of the scrap iron division recently formed by Gary Steel Supply Co., Chicago. Formerly a partner in Paul R. Simon Co., Mr. Simon was assistant to the chief of the Scrap Iron & Steel Section, OPS, during 1951.

H. B. Plunkett has been elected executive vice president of A. P. Green Fire Brick Co., Mexico, Mo. Mr. Plunkett has been with the Green company since shortly after being released from the Navy as a lieutenant at the end of World War I. Experienced in all phases of the Green company's operations, Mr. Plunkett recently was vice president and manager of domestic and Canadian affiliate companies. He presently is serving as chairman of the Mellon Institute committee which controls the research program of the Refractories Institute.

♦ ♦ ♦

Arthur C. Fegel has been elected president, Nassau Smelting & Refining Co., New York, succeeding **William A. Scheuch,** who has held the position 8 years. Mr. Scheuch was research metallurgist for Western Electric Co. in 1931 when it acquired Nassau Smelting and he became the subsidiary's first plant manager. He was elected vice president-director in 1939. Mr. Fegel was at Western Electric's Kearney, N. J., works when he became vice president of Nassau in 1952. He was named executive vice president in February.

♦ ♦ ♦

Hugh Gibbons has been appointed supervisor of the Rx Met Division, Michigan Steel Casting Co., Detroit. A graduate of University of Michigan, Mr. Gibbons was previously associated with Cannon Muskegon Corp., Muskegon, Mich., and Hillsdale Foundry Co., Hillsdale, Mich.

♦ ♦ ♦

R. H. Davies, vice president, Clark Equipment Co., Buchanan, Mich., has been appointed chairman of the planning committee for Material Han-

(*Continued on page* 142)

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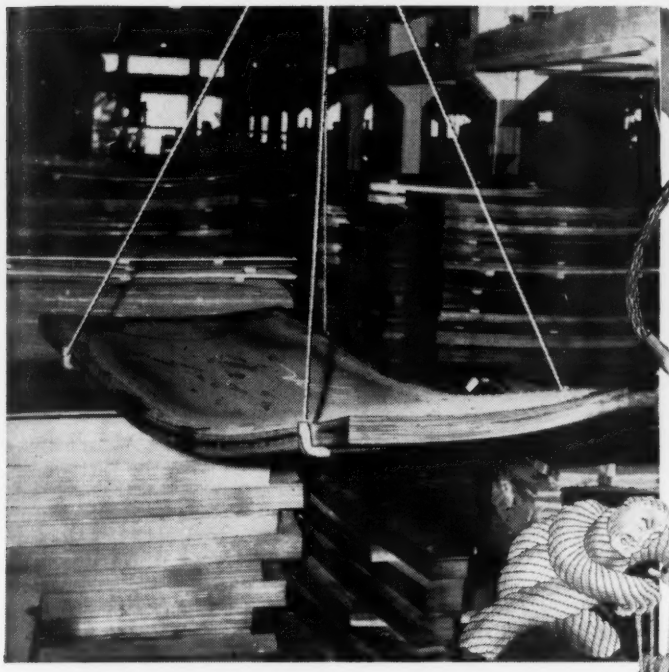

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MEN OF INDUSTRY

WILLIAM F. HARPER
. . . joins General Metals Corp.

NORMAN BIRCH
. . . operations v.p., Brake Shoe

BERNARD J. ESAREY
. . . Brake Shoe works manager

I. EUGENE COX
. . . American Brake Shoe v.p.

(*Continued from page* 140)

dling Institute's 1956 Cleveland exposition, proceeds of which will be used to finance educational programs concerning the material handling industry.

♦ ♦ ♦

William F. Harper has been appointed administrative assistant to the president, General Metals Corp., San Francisco. A graduate of Newark College of Engineering, Mr. Harper was previously associated with Consolidated Vultee Aircraft Co., San Diego, Calif., and Allen B. DuMont Laboratories, which are located in Clifton, N. J.

♦ ♦ ♦

Frederick W. Smith has been appointed superintendent of production, Penn Machine Co., Johnstown, Pa. For 17 years Mr. Smith was with the Transportation and Generator Division, Westinghouse Electric Corp., East Pittsburgh, Pa., where he was recently supervisor of steel fabricating.

Norman Birch has been made vice president in charge of operations, National Bearing Division, American Brake Shoe Co., St. Louis. He joined the company in 1939 and held various positions in company metallurgical departments, progressing to general foundry superintendent in 1952. **I. Eugene Cox** now is vice president in charge of engineering and development. Formerly he was vice president in charge of engineering, having joined the company in 1935 as a research engineer. At the Meadville, Pa., plant **Bernard J. Esarey** has been made works manager. He continues as chief engineer of the National Bearing Division in addition to his new job. With Brake Shoe since 1942 as a bearing engineer, he was appointed district engineer in 1944 and chief engineer in 1947.

♦ ♦ ♦

Carl R. Sare, since 1952 vice president, W. W. Sly Mfg. Co., Cleveland, has been named president of the company, succeeding **Frank W. Klatt,** retired. Mr. Sare was graduated from University of Pittsburgh, and previously was assistant to the president, Patterson Foundry & Machine Co., East Liverpool, O., production executive, American Steel & Wire Division, U. S. Steel Corp., and sales engineer, A. M. Byers Co. and Jones & Laughlin Steel Corp., Pittsburgh.

♦ ♦ ♦

John Lawrence, for the past year vice president of manufacturing and engineering, Joy Mfg. Co., Pittsburgh, has been named executive vice president. A graduate of Massachusetts Institute of Technology, he joined the company in 1951 as vice president - manufacturing. Previous connections include vice president, SKF Industries Inc., Philadelphia, and factory manager, Jones & Lamson Machine Co., Springfield, Vt.

♦ ♦ ♦

Bailey D. Herrington, recently elected chairman of the Northwestern Pennsylvania Chapter of the AFS for 1954-55, is sales engineer, Hickman, Williams & Co., which he joined in 1925. A native of Braznell, Pa.,

(*Continued on page* 144)

FREDERICK W. SMITH
. . . joins Penn Machine Co.

CARL R. SARE
. . . heads Sly Mfg. Co.

JOHN LAWRENCE
. . . Joy Mfg. Co. executive

BAILEY D. HERRINGTON
. . . AFS chapter chairman

HERE'S WHY these foundries bought Edco Dowmetal Bottom Boards

Results! Satisfaction! Here are just a few of the progressive foundries where Edco Dowmetal Bottom Boards are in use. We have eliminated their Bottom Board problems—with resulting dollar savings—by producing for them a top-quality, permanent, yet easy-to-handle Bottom Board. Possibly you have a similar problem—or one which you feel is a "tough one," without a definite answer. Either way, we would welcome the opportunity to talk to you about it.

Write us, or phone MAnsfield 6-7330 for price schedule and list of 83 standard sizes available from stock.

"EDCO Dowmetal Bottom Boards eliminate swelled castings" . . . says E. F. Dublinski, Foundry Superintendent, Mid-City Foundry Co., Milwaukee, Wis.

"We cut our board losses from 7500 down to 12 . . . by switching to EDCO Dowmetal Bottom Boards"—says R. D. Baysinger, Manager, Foundry Division, Greenlee Bros. & Co., Rockford, Illinois.

"Our EDCO Dowmetal Bottom Boards have paid for themselves in one year . . . " says Emmett Torkelson, Foundry Superintendent, Louis Meskan Brass Foundry, Inc., Chicago, Illinois.

"Rejects reduced to an absolute minimum since using EDCO Dowmetal Bottom Boards" says Bob Petcher, Foundry Superintendent, Josam Mfg. Co., Michigan City, Ind.

"Our EDCO Dowmetal Bottom Boards Hold Up at High Temperatures . . . " says Robert H. Garrett, General Foreman, Lebanon Steel Foundry, Lebanon, Pennsylvania.

"Burning and Breakage loss not a factor since using EDCO Dowmetal Bottom Boards" . . . says Olney Foundry, Link-Belt Company, Philadelphia, Pa.

CHRISTIANSEN CORPORATION

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EDCO DOWMETAL BOTTOM BOARDS • EDCO ALUMINUM INGOT

MEN OF INDUSTRY

(*Continued from page* 142)

Mr. Herrington was educated in Pittsburgh schools and supplemented his work by attending evening courses at Carnegie Institute of Technology. A charter member of Northwestern Pennsylvania Chapter, he served as secretary, director, and was its vice chairman last year.

♦ ♦ ♦

S. T. Jazwinski has become director of research, Central Iron & Steel Co., Phoenix Iron & Steel Co., and Chester Blast Furnace Inc., subsidiaries of Barium Steel Corp., New York. Mr. Jazwinski was engaged in management positions in Polish and English foundries until 1946, when he became associated with Barium Steel Corp., as chief metallurgist and vice president of two subsidiaries. After a year in Brazil as metallurgical consultant he became senior staff engineer, metallurgical department, Ford Motor Co., Dearborn, Mich., returning to the Barium group in 1952 as chief research metallurgist.

♦ ♦ ♦

Philip O. Geier Jr. has been appointed sales manager of Cincinnati Milling Products Division, Cincinnati Milling & Grinding Machines Inc., Cincinnati. Mr. Geier has been with the company over 15 years. In his new position he will be responsible for the sale of cutting fluids and grinding wheels.

♦ ♦ ♦

Samuel H. Cleland, Michigan manager, Eastern Clay Products Department, Chicago, retired recently as reported in September FOUNDRY. Engaged in foundry equipment sales in Chicago from 1906 to 1919, he then became a manufacturer's agent in New York and played a major part in introduction of synthetic sand to American foundries. In 1926 he organized Eastern Clay Products Co., in Jackson, O., and was successively salesman, sales manager, and president-general manager. During 1932 he resigned as president and became Michigan manager, continuing in this capacity when the company became a department of International Minerals & Chemical Corp. in 1952.

♦ ♦ ♦

John Wallis has been appointed general foreman of the large and small sand foundries, Aluminum Co. of America, Cleveland. **Joseph Shienkiewicz** will devote full time to large floor work, patterns and rigging. Other sand foundry appointments include: **E. H. Webster,** general foreman of the coreroom; **Mike Trivison,** small foundry general foreman; **Al Hayden,** shipping room department head in addition to his present duties as heat treat department head. **Charles Andel** is now test laboratory foreman.

♦ ♦ ♦

James E. McComb has been appointed San Francisco area field engineer, Miller Fluid Power Co., Melrose Park, Ill. **Don L. Boox** has been assigned Mr. McComb's former duties in sales engineering. **Terry Morris** has been transferred from the production control department to succeed Mr. Boox in the order processing department.

♦ ♦ ♦

Donald A. Comes has been elected vice president, Farrel-Birmingham Co., Ansonia, Conn. Mr. Comes joined the company in 1922, and after a period of sales and development work in 1946 became assistant general sales manager. Last year he was named general sales manager, a position he will continue to hold.

Claude B. Schneible, elected chairman of the Detroit Chapter of the AFS for 1954-55, is president, Claude B. Schneible Co., Detroit, which he established in 1935 in Chicago. The company was moved to Detroit in 1943. Mr. Schneible, who attended Northwestern University, from 1918 to 1924 was associated with American Foundry Equipment Co., now American Wheelabrator & Equipment Corp., Mishawaka, Ind. Following 4 years in engineering research he returned to American Wheelabrator as factory representative. A past president and chairman of Foundry Educational Foundation, 1950 and 1951, he served as president of the Foundry Equipment Manufacturers Association in 1953, and is currently a national director of American Foundrymen's Society.

S. T. JAZWINSKI
. . . director of research

PHILIP O. GEIER JR.
. . . sales mgr., Cincinnati

SAMUEL H. CLELAND
. . . retires, Eastern Clay Dept

CLAUDE B. SCHNEIBLE
. . . Detroit Chapter chairman

♦ ♦ ♦

Richard R. Senz has been named chief metallurgist, Buffalo Works, Aluminum Co. of America, Pittsburgh. After graduation from Case Institute of Technology in 1936, he joined Alcoa's Cleveland Works where until recently he was staff metallurgist. During the war he was plant metallurgist at the company-operated Defense Plant Corp., Monroe, Mich.

♦ ♦ ♦

Leonard Romano has been appointed Michigan area core oil sales representative, Penola Oil Co., Detroit. A graduate of University of Michigan in 1951, he was previously foundry laboratory engineer, Packard Motor Car Co., Detroit.

♦ ♦ ♦

James Rush has been appointed grinding wheel representative in the Indianapolis territory, Electro Refractories & Abrasives Corp., Buffalo.

(*Continued on page* 146)

You said it, young man! Chemically pure, clay-free Shell-Molding Penn-Sand offers the right screen distribution that produces castings of excellent micro-inch finish. In addition, its high refractoriness minimizes burn-in. Priced economically, Shell-Molding Penn-Sand is available for immediate shipment either bulk or bagged. For complete information and free samples, mail the coupon today to Pennsylvania Glass Sand Corp., the nation's leading producers of Quality Foundry Sands and Silica Flour.

"WOW . . . Look at that finish!"

Thanks to Shell-Molding PENN-SAND

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THE SURE START TO A PERFECT FINISH

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COMPANY _____

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MEN OF INDUSTRY

C. R. HELLER
. . . FEMA secretary-treasu er

JACK E. HEUSER
. . . Le Roi Co. v. p.

JAMES R. HARWOOD
. . . division sales mgr.

THOMAS R. EGGERT
. . . sales, L. F. M. Co.

(*Continued from page* 144)

Prior to joining the company, he attended Wittenberg College and had 2 years of Navy service.

♦ ♦ ♦

C. R. Heller, for the last 7 years manager of the Washington office, Link-Belt Co., Chicago, has been appointed executive secretary-treasurer, Foundry Equipment Manufacturers Association, which recently moved its headquarters from Cleveland to Washton. Mr. Heller served 5 years during World War II with the War Production Board as head of the Materials Handling Equipment Branch. Previously he spent 30 years with Jeffrey Mfg. Co., Columbus, O., where he became vice president.

♦ ♦ ♦

James D. Fraser has joined the foundry sales department, C. O. Bartlett & Snow Co., Cleveland. Mr. Fraser was graduated from Purdue University and for 8 years was associated with Chicago Works, National Malleable & Steel Castings Co., Cleveland, where he has served in the engineering department and as suprintendent of the steel finishing department.

♦ ♦ ♦

Jack E. Heuser has been appointed vice president-sales, Le Roi Co., Milwaukee, subsidiary, Westinghouse Air Brake Co., Pittsburgh. A University of Wisconsin graduate, he joined the company in 1939. Following 5 years in Ampco Metal's sales organization he returned to Le Roi in 1946 as assistant to the general sales manager, recently serving as Engine Division sales manager. **James R. Harwood** has been named the company's Transo Division sales manager. He was graduated from Marquette University and from 1950 was Construction and Mining Division representative for Le Roi in Ohio, Michigan and western Pennsylvania, until last year when he became a Transo Division sales engineer.

♦ ♦ ♦

M. D. Mullin has been made Milwaukee branch manager, Corn Products Sales Co., New York. He joined the company in 1934 and in 1939 was transferred to Chicago, where be became staff assistant to the vice president of the Central Division. **Don H. Hays** has been named St. Louis branch manager. Joining the company in 1932, he served in Detroit, Grand Rapids, Mich., and Indianapolis, **J. W. Cotton** has become Louisville office manager, a position Mr. Hays has held since 1946. Mr. Cotton, with Corn Products since 1936, became Grand Rapids, Mich., district representative in 1946 following military service. Since 1952 he has been staff assistant to the vice president in Chicago.

♦ ♦ ♦

Thomas R. Eggert, formerly assistant production manager of General Steel Castings Corp., Granite City, Ill., has been appointed assistant sales manager, L. F. M. Co., Atchison, Kans. Mr. Eggert was graduated from Massachusetts Institute of Technology, Cambridge, Mass., in 1950 with a degree in gen-

(*Concluded on page* 149)

JAMES D. FRASER
. . . joins Bartlett & Snow

M. D. MULLIN
. . . Corn Products branch mgr.

DON H. HAYS
. . . St. Louis branch mgr.

J. W. COTTON
. . . Louisville office mgr.

protect your profits with

APEX ... Z-50

ALUMINUM ALLOY

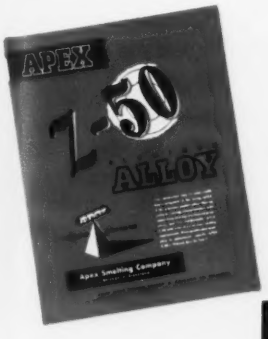
QUALITY AND ECONOMY

tested and proved on the job

Above average mechanical properties, uniform casting characteristics and free machinability make Z-50 aluminum alloy developed by Apex an outstanding money saver on your production line.

Fulfilling the foundry's need for a quality all-purpose alloy, Apex Z-50 polishes and buffs to a satin finish, has excellent response to anodizing and other chemical and electrochemical finishes. Its as-cast properties are right for most castings, it may be treated for highly stressed castings, and it provides superior dimensional stability with an aging treatment.

Apex Z-50 is another superior product of Apex research and scientifically controlled production, tested and proved in the foundry field and in final application.



Send for your copy of Apex Z-50 folder showing composition, physical properties, and permanent mold and sand cast mechanical properties.

Research leadership back of every ingot

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Delta Deburring Machines do a fast, high quality deburring and finishing job on castings. Delta Power Tools enable Meta-Mold to offer customers a complete machining and finishing service at "rock bottom prices."

Simultaneous reaming and flycutting of washing machine agitators is only one of the many machining operations Meta-Mold performs on Delta 17" Drill Presses. Note the Delta Slo-speed attachment (4.7 to 1 reduction) for precision reaming.

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Meta-Mold's all-DELTA Shop

. . . CUTS FOUNDRY FINISHING COSTS

. . . MAKES PROFITABLE MACHINING SERVICE POSSIBLE

Making top-quality castings is only part of the job Meta-Mold Aluminum Company does for its customers. In addition, it offers a complete—and profitable—service in machining those castings.

Rockwell-built Delta Tools do the work. Delta Deburring Machines insure speed and quality of surface finishing—Delta Drill Presses provide fast, precision machining. Together, they make up a low cost machine shop that turns rough castings into finished parts, ready for assembly.

John Drydyk, superintendent, reports: "Our Delta Tools take a terrific beating, yet they hold their accuracy. That makes it possible to do a precision machining job to exact customer specifications. The high quality of work they turn out, plus their fast output, keeps our costs down and allows us to offer machining services at rock bottom prices."

In foundries from coast to coast, Delta Woodworking and Metalworking Power Tools are taking big bites out of the cost of pattern making, header removal, surface finishing and machining. Their ability to handle multiple jobs cuts handwork and set-up time—their accuracy eliminates rejects—their portability provides maximum foundry pattern shop flexibility. Let your Delta Dealer prove to you that Delta Power Tools, properly used, will pay you in lower costs—higher production. He's listed under "Tools" or "Machinery" in your classified phone book. Send the coupon for full information.

DELTA QUALITY POWER TOOLS

Another Product by **Rockwell**

DELTA MILWAUKEE

DELTA QUALITY MAKES THE DIFFERENCE

(*Concluded from page* 146)

eral engineering. After graduation he was assistant to the technical director of the Steel Founders' Society of America, Cleveland, until 1952 when he joined General Steel Castings Corp.

♦ ♦ ♦

R. H. English, recently named president of the Pittsburgh Foundrymen's Association, is chief metallurgist, National Alloy and Power Piping Divisions, Blaw-Knox Co., Pittsburgh. He was graduated from Carnegie Institute of Technology and had a year of graduate work at University of Pittsburgh. Since he joined the National Alloy Division in 1929 as assistant metallurgist, Mr. English has been engaged in melting, sand control, casting design, etc., with research work in the physical chemistry of steel making and high-temperature alloy development. He was chairman of the Technical Research Committee and vice president of the Alloy Casting Institute for two years, and served as vice president of the Pittsburgh Foundrymen's Association last year.

R. H. ENGLISH
. . . heads Pittsburgh founders

RICHARD E. BABCOCK
. . . Federal Foundry sales

GEORGE H. CALIGAN
. . . refractories sales mgr.

C. C. BLANDY
. . . France Refractories sales

♦ ♦ ♦

George Polanka has been appointed Cleveland sales engineer, Shell Process Inc., Chicopee, Mass. A graduate of Case Institute of Technology, for 7 years he has been chief engineer of the metallurgical products division, Thompson Products Co., Cleveland. Previously he was associated with Westinghouse Electric Co., East Pittsburgh, Pa., and Tocco Division, Ohio Crankshaft Co., Cleveland.

♦ ♦ ♦

O. DeG. Vanderbilt III has resigned as president of Taylor-Wharton Iron & Steel Co., Norwood, O. in order to devote more time to the Twisco Corp. **R. D. Hill,** executive vice president, will be chief executive officer of Taylor-Wharton with headquarters in High Bridge, N. J. **O. DeG Vanderbilt Jr.** continues as chairman of the board of Taylor-Wharton.

♦ ♦ ♦

Richard E. Babcock recently joined Federal Foundry Supply Co., Cleveland, to handle the company's line of supplies and equipment in the lower peninsula of Michigan, excluding Detroit. He will also cover part of northern Indiana. Since graduating from University of Michigan in 1939, Mr. Babcock has been associated with several Michigan foundries in the Grand Rapids and Muskegon area.

♦ ♦ ♦

J. P. Coughlin, former manager, Arc Welding Division, Westinghouse Electric Corp., Buffalo, has joined Eutectic Welding Alloys Corp., Flushing, N. Y., as assistant to the president. Mr. Coughlin was in charge of welding, sales engineering and production during his 15 years with Westinghouse.

♦ ♦ ♦

Emil H. Howe has been appointed vice president-sales for the pump division, and John W. Weaver, vice president-sales for the foundry division, Waukesha Foundry Co., Waukesha, Wis. They will serve on the company's executive committee.

♦ ♦ ♦

Brooks McCormick has been appointed director of manufacturing, International Harvester Co., Chicago. For the past 2 years he was head of the company's British subsidiary.

♦ ♦ ♦

Elmer O. Bischoff, controller, Grede Foundries Inc., Milwaukee, was recently named director of the local control, Controllers Institute of America, New York. Other local control directors include: **Clyde R. Dean,** assistant treasurer, Electric Steel Foundry Co., Portland, Oreg.; **Keith J. Harris,** vice president, Ross-Meehan Foundries, Chattanooga, Tenn.; and **John R. Kahler,** secretary-treasurer, Sandusky Foundry & Machine Co., Sandusky, O.

♦ ♦ ♦

George H. Caligan, since 1948 district manager of New England sales, American Refractories & Crucible Corp., North Haven, Conn., has been appointed company sales manager. Mr. Caligan attended University of Connecticut and joined American Refractories following 3 years of military service in World War II.

♦ ♦ ♦

C. C. Blandy has been appointed Philadelphia district sales engineer, J. H. France Refractories Co., Snow Shoe, Pa., where he will work with the Van Brunt Co., Philadelphia distributors of the company's refractory products. Mr. Blandy attended Pennsylvania State University and previously was in the company's headquarters sales office.

♦ ♦ ♦

L. Jack Clarke has been appointed general sales manager, Leschen Wire Rope Division, H. K. Porter Co., New York, with headquarters at the division office in St. Louis. Previously he was New Orleans area field representative and New York district manager.

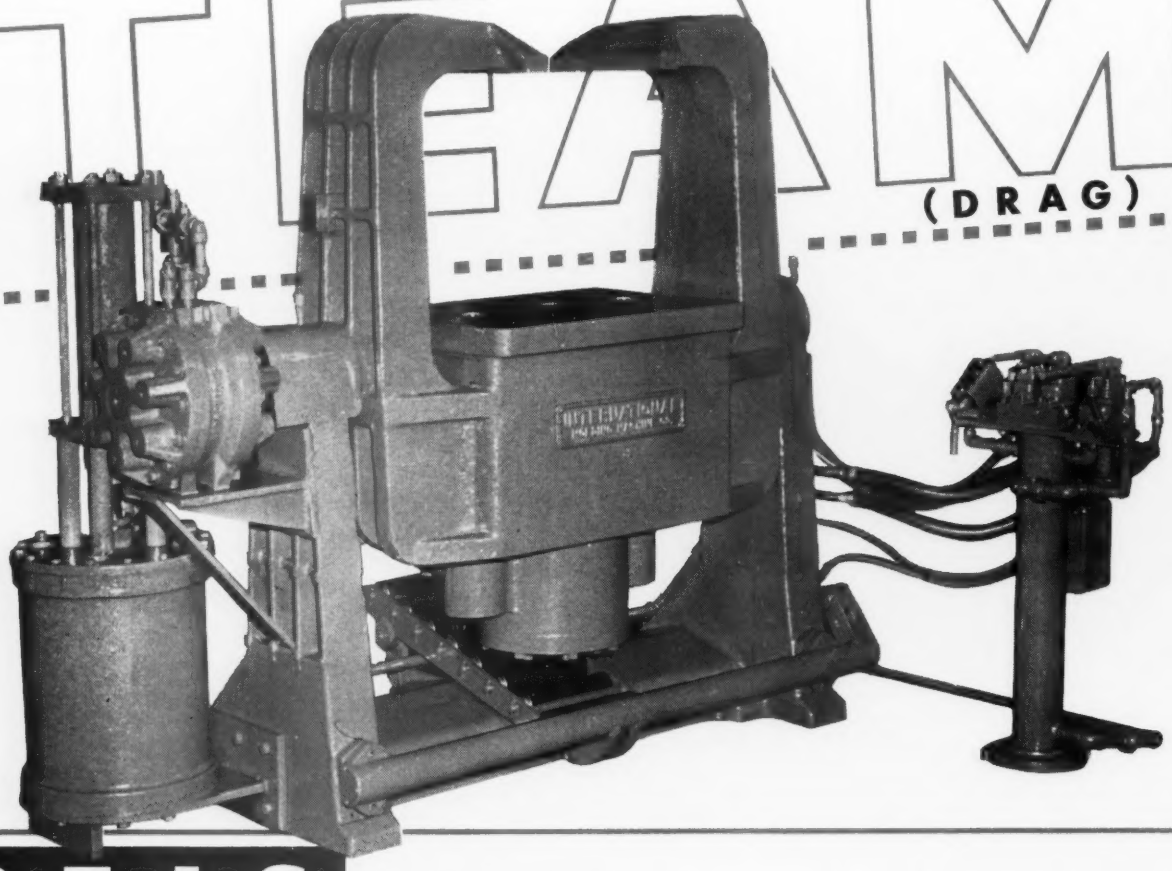
♦ ♦ ♦

Henry J. Gagen has been appointed western district manager, Gifford-Wood Co., Hudson, N. Y., with headquarters in Chicago. A graduate of Purdue University, he joined the company's New York office 6 years ago as sales engineer.

INTERNA

TEAM

(DRAG)



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- Rugged–Simple Construction for Easy Maintenance.
- Fast, Smooth, Accurate–Quality Low Cost Production.

FEATURES

- Double Jolt Cylinders–Assures Hard Uniform Ramming–800 lbs. Capacity.
- Squeeze Cylinder–Provides 13,000 lbs. Squeeze Pressure at 80 lbs. PSI. 9½" Stroke.
- Mold Squeezed and Clamped before Rollover makes it impossible for Flask to drop away from Pattern Plate.
- Rollover–Air-on-Oil-Powered Hydromotor for Positive, Fast, Firm Turnover with Smooth (non-bump) Stop Action. On Hand Operated Model ONE Simple Control Valve for entire Rollover operation–No touchy jogging or braking necessary.
- Draw True and Accurate–due to Rigid Machine Design and Alignment, augmented by Double Jolt Cylinder Pistons which also serve as Extra Guides for Draw of Pattern.
- Rollers–Raised by air after draw for mold push-out.
- Vibrator and Vibrator Valve–Standard Equipment.
- Pilot Controlled Master Valves.
- Your Choice of Operating Controls–
  1. Complete Automatic Cycle–Adjustable Timing.
  2. Automatic Jolt Timer–Balance of Cycle Hand Operated Pilot Valves.
  3. Complete Hand Valve Operation...or...
  4. Any Combination to Suit Your Requirements.

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"There is an INTERNATIONAL for every job"

Internationals are designed and built by experienced Foundry Engineers who have a practical knowledge of the problems of the foundry business.

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MATES

(COPE)

PK-20

Jolt, Squeeze, Draw
Air Pin Lift

Jolts, squeezes, draws and air pin lifts. All-purpose electric automatic cycle control.

Simply dial the jolts. Fast regulation for number of jolts required.

Ready adjustments of cams for complete timing cycles. Fast, positive, dependable.

Continuous full cycle, split cycle, or manual controls.

Safety features throughout.

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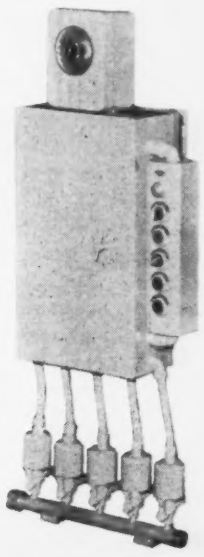

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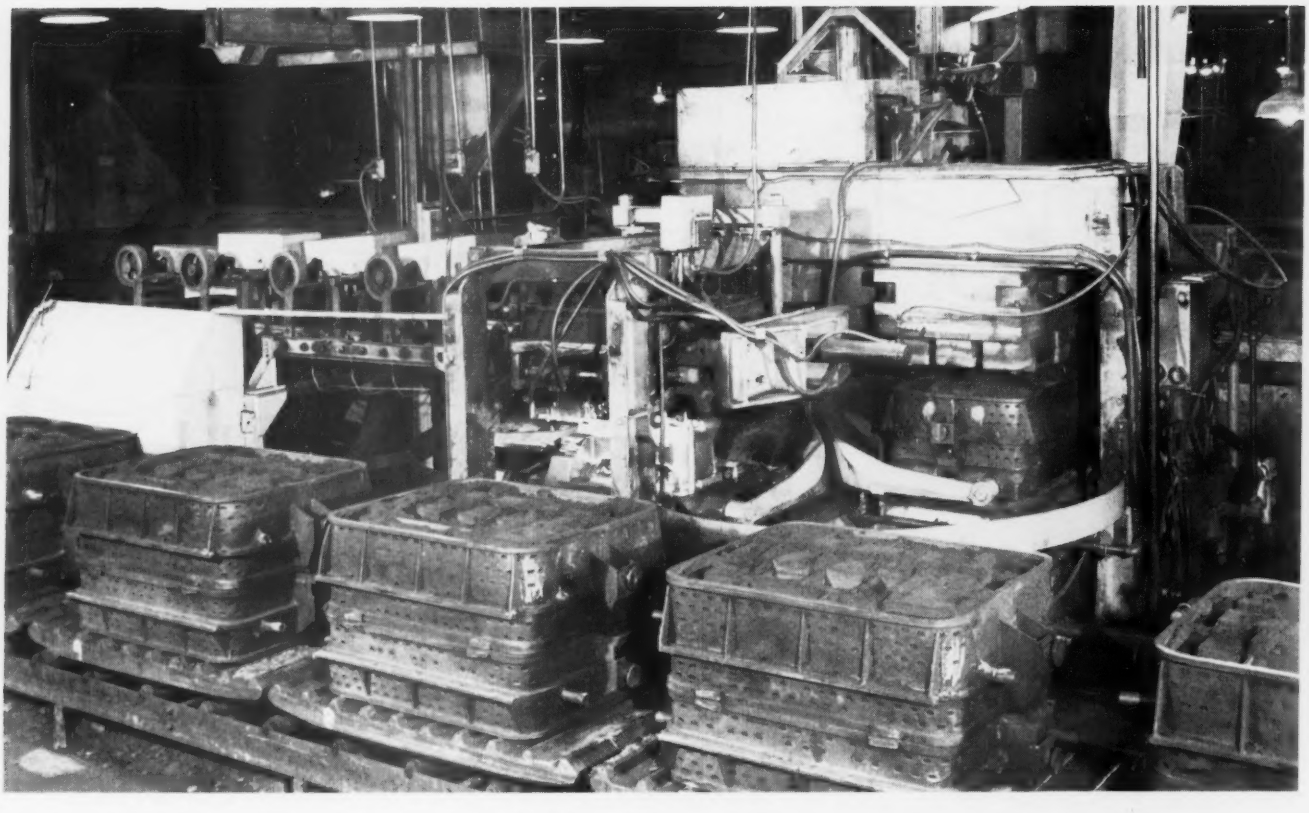

Fig. 1—Crankcase molds pass four-station indexing machine on conveyor. The conveyor pictured in the left background feeds copes to the machine

AUTOMATIC MOLDING MACHINES

Speed Engine Block Production

OPERATIONS in the Flint, Mich., foundry of Buick Motor Division, General Motors Corp., have taken another important step toward automation. Having pioneered, in co-operation with Osborn Mfg. Co., in the automatic production of nearly all dry sand cores for engine castings on indexing Osborn core-making machines, Buick, with corresponding co-operation by Osborn, recently has applied similar procedures to making large green sand molds for Buick V-8 engine cylinder blocks.

The new molding machines produce molds on a semiautomatic basis at a current rate of 180 complete molds an hour. This high rate, it is expected, will be increased to 240 an hour.

This installation of two indexing molding machines is the first of its kind and the machines are the first to produce molds of so large a size and complexity as are required for Buick engine cylinder blocks. One machine makes copes, Fig. 1, and a similar one produces drags. They are identical in principle but require somewhat different setups and auxiliary equipment partly because the cope is deeper than the drag, and the latter has to be turned over whereas the cope remains with the pattern impression down in the position in which the mold is made.

Each new machine has four stations and includes an indexing spider that carries the patterns and molds from station to station. Besides the molding machines themselves, various auxiliaries for bringing flasks to the machines, removing molds from the machine and supplying sand to fill the mold have to be provided. Each of the automatics includes a make-ready station, flask loading and filling station, jolt squeeze ramming station and draw station, all combined in one integrated unit.

Operation of each machine requires a conveyor that brings flask components to the machine, picks up the completed mold halves and delivers them to another conveyor on which the cope and drag, along with necessary cores, are assembled. There also is a conveyor that re-

(*Continued on page* 154)

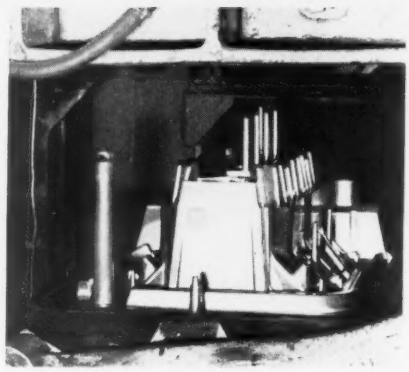

Fig. 2—Metal cope pattern is blown off at station 1, sprayed with lubricant and indexed for sand filling

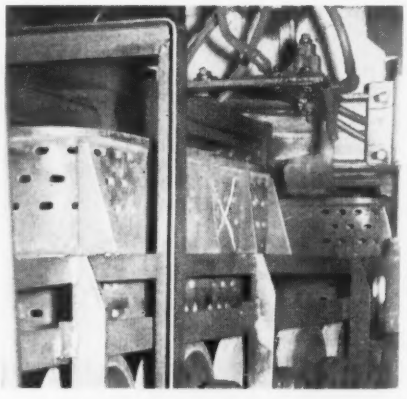

Fig. 3—Part of conveyor that feeds copes singly into filling station. Filling hopper appears at top center

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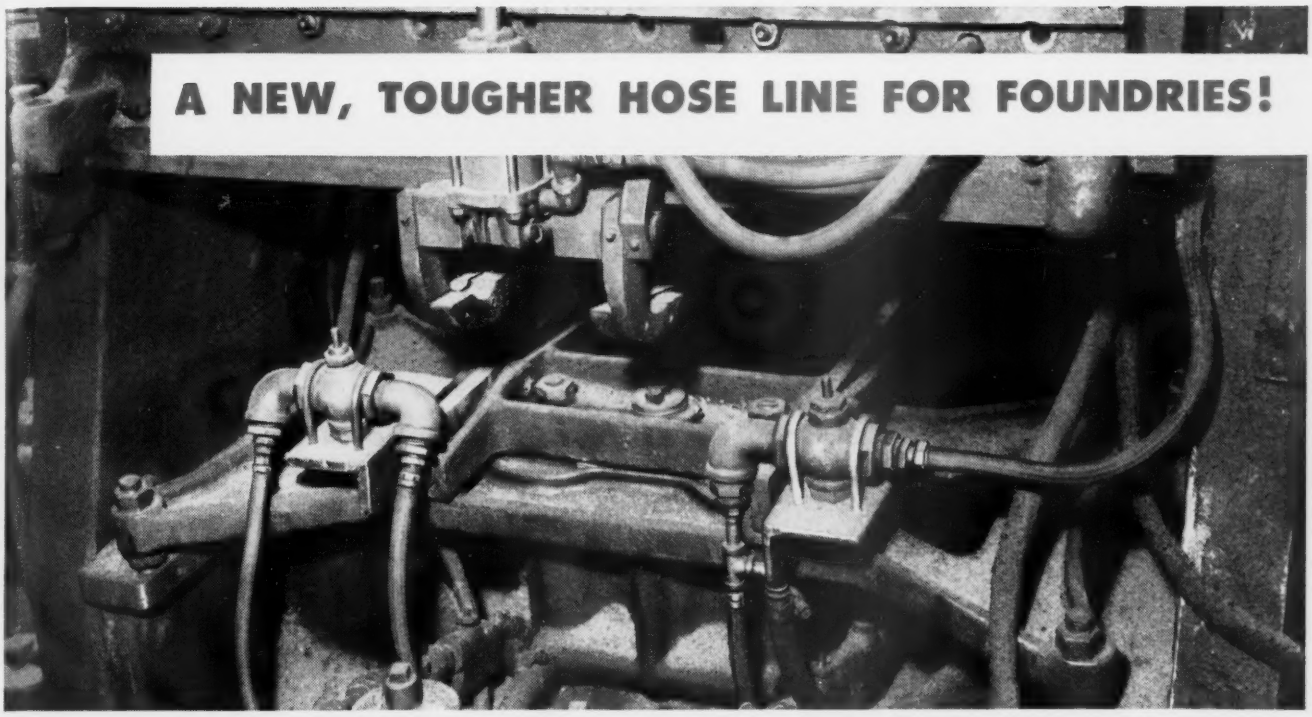
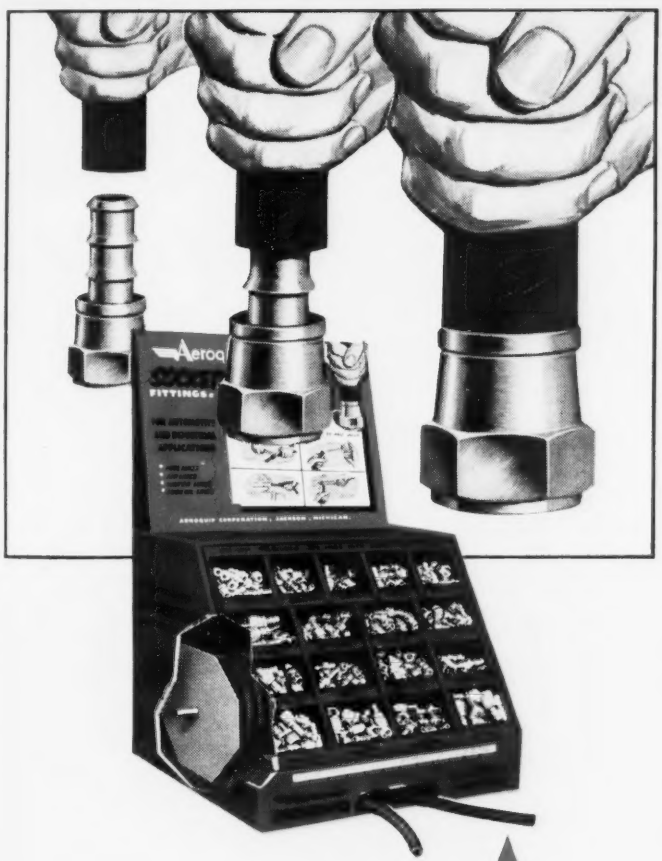


Typical foundry application—a core roll-over draw machine.



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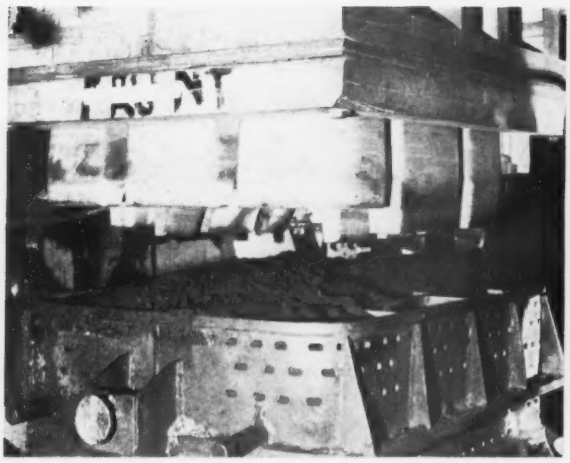

Fig. 4—Mold before squeezing at jolt and squeeze station; green sand already added

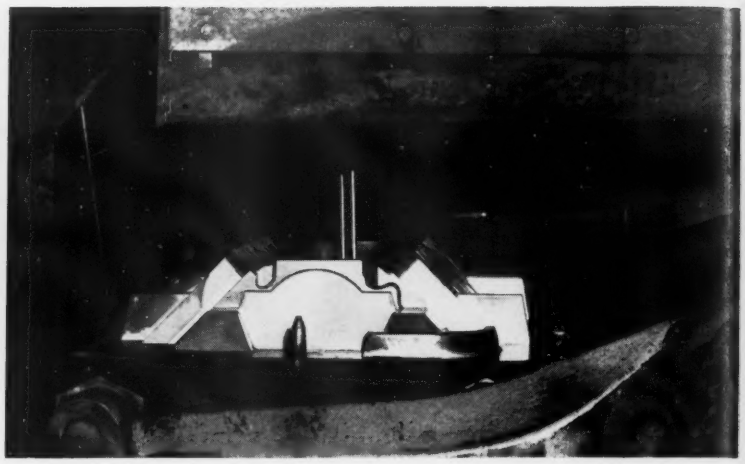

Fig. 5—At the second machine's first station, drag patterns are blown off and sprayed with parting lubricant

(*Continued from page* 152)

turns flasks to the shorter machine, feeding conveyors after the molds with flasks have passed through shakeouts.

This handling equipment, though not a part of the molding machines, has to be integrated with them and synchronized so that flasks approach and enter the machines at the proper intervals and that mold halves are handled out of the machines when ready for such transfer. Indexing and transfers are done pneumatically in response to solenoid valves actuated by master timing controls and limit switches. Indexing is positive, and locating pins insure precise location of molds at each station.

Consider first the machine that makes copes. Fig. 2 shows a metal pattern at the station where it is blown off by a hand-controlled air jet and then is given a hand sprayed coating of parting lubricant. While this proceeds, the conveyor shown at left in Fig. 3 moves the cope flask into the second station. When indexing is completed, the pattern is elevated automatically inside the cope flask by an air cylinder. The pattern picks up the flask in readiness to receive the sand.

Slight further upward motion results in opening the sand hopper gates, releasing a predetermined amount of sand to substantially fill the cope. Thereupon, the pattern, with the flask still in place, is lowered until it rests upon the indexing spider, which then indexes the pattern with the flask into the third station where it comes under a jolt squeeze machine, as in Fig. 4.

As jolting starts, small chutes add sand in corners of the flask that are not filled completely at the prior station. Jolting and the squeeze which follows it take place with the mold elevated free of the spider. After the squeeze, the spider

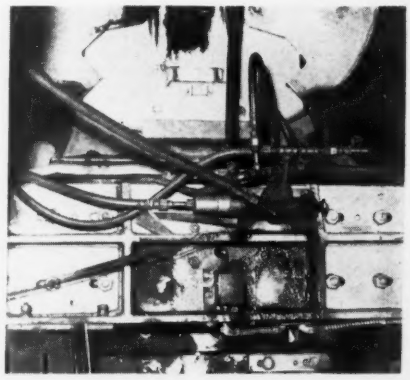

Fig. 6—Drag pattern and flask are lifted to filling position

is raised and picks up the mold, whereupon the spider indexes the mold to the fourth and final station.

At the final station the mold is drawn upward off the pattern, which

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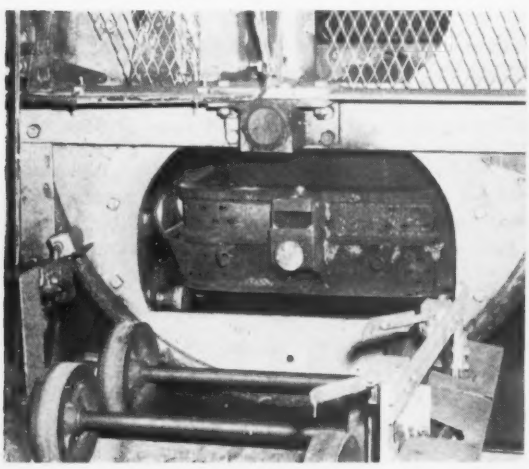


Fig. 7—After finished drag is ejected, it is inverted, ready to move onto conveyor

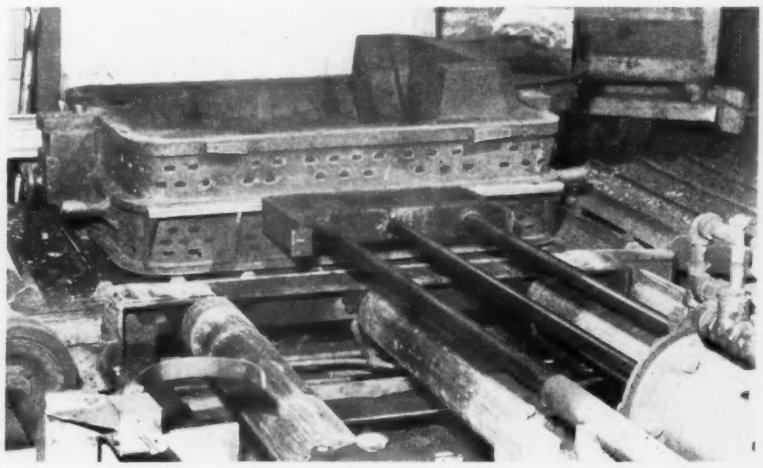
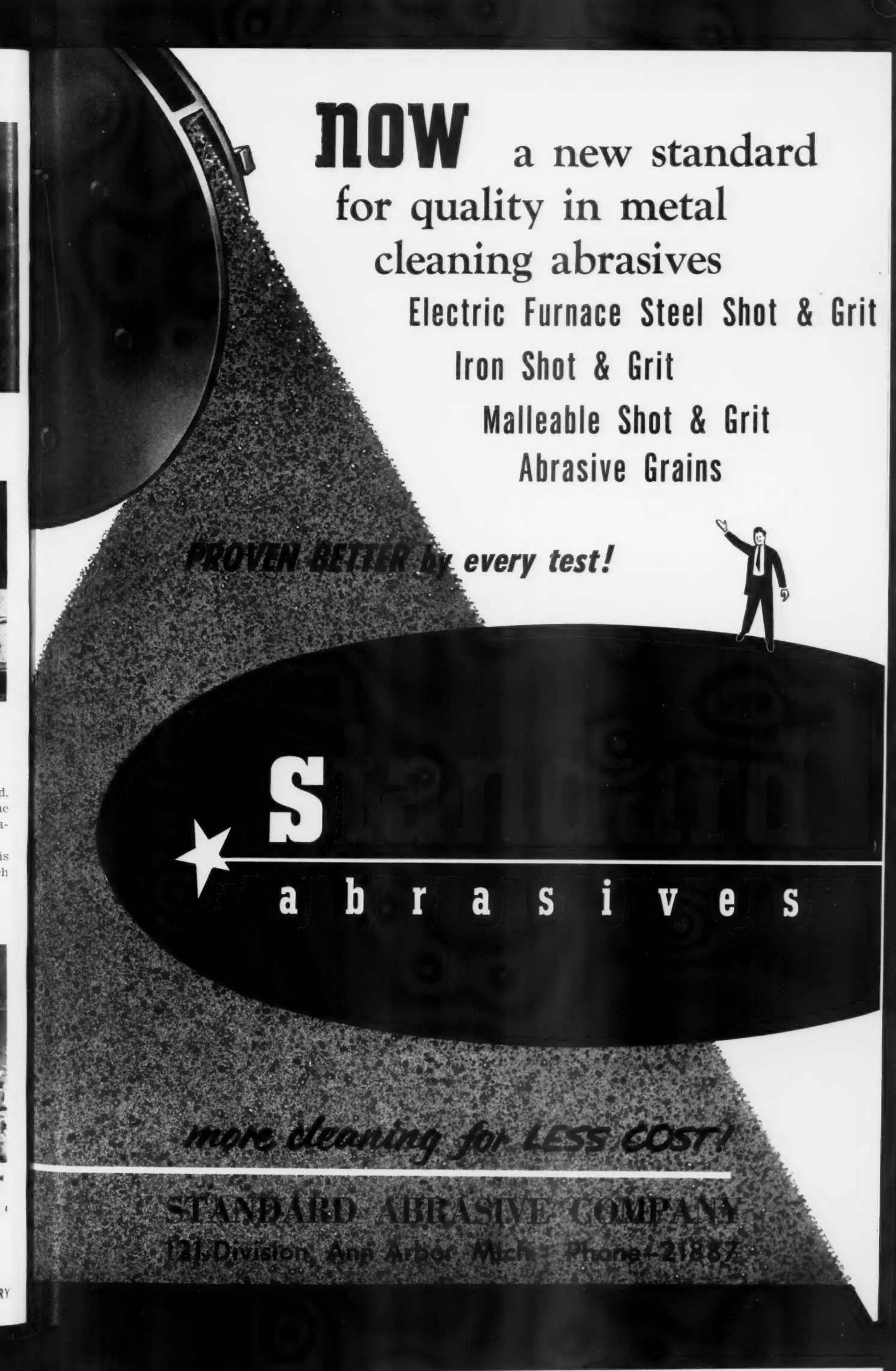


Fig. 8—Drag being pushed onto a pallet of the conveyor on which the complete mold later is assembled and poured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(*Concluded from page 154*)

is locked momentarily. Upon reaching its high level, the mold is ejected onto a conveyor along which it is moved until it reaches the position where the cope is assembled to the drag, no turnover being required.

After the pattern is free of the mold, it is lowered onto the spider and subsequently is indexed into the first station where it is blown off in starting the next cycle. Because the machine has four stations, it requires and uses four duplicate patterns each of which follows the preceding one through an identical cycle. In this way, all stations are used after each indexing and one cope mold comes from the machine for each indexing.

Drag halves are made in precisely the same way as copes but are somewhat shallower and, of course, require a different pattern, one of which appears at the blowoff station in Fig. 5. Fig. 6 shows the second or filling station after the pattern has been elevated, lifting the drag to filling position with the sand hopper opened.

Withdrawal of the pattern occurs in the fourth station by elevation of the mold and, when it reaches its top position, the mold is ejected into the upper half of the rollover shown in Fig. 7. When fully inside the rollover, the latter automatically turns through 180 degrees, leaving the drag ready to be pushed off onto the conveyor shown in the foreground of Fig. 7.

In Fig. 8 the drag mold is shown moving out of the turnover and into contact with limit switch levers that are rocked as the mold moves out. After the drag leaves the wheeled conveyor, it rolls onto the powered rolls, right in Fig. 8, and remains until centered opposite a pallet of the adjacent pouring conveyor. Then an air ram advances and pushes the drag onto the mold conveyor. Such transfers occur automatically and no labor is required in any handling of copes or drags at any point except where a hoist is attached to lift the cope off its conveyor and lower it onto the drag in assembling the mold.

Before this assembly is made, dry sand cores are taken from core conveyor racks and placed in core-setting fixtures. When the set of cores is in place, the cope is lowered onto the drag, leaving the mold ready for pouring.

Pouring is done on the conveyor shown in Fig. 1 but not until the molds are advanced into the pouring area. After pouring, the molds pass through cooling tunnels and finally arrive at shakeouts where flasks are emptied, castings are removed and cope and drag halves are conveyed back to the two molding machines described.

It is noteworthy that the only labor involved directly in making the molds is that of one man at each of the two indexing molding machines. These two men replace several formerly working on individual molding machines. A great part of the saving is in molding operations, although some is attributed to handling improvements outside the molding machines.

Similar machines are now on order for use on cylinder heads and for several smaller castings.

Meetings of Interest to Foundrymen

Sept. 28-Oct. 1—Iron and Steel Exposition, Association of Iron and Steel Engineers, Cleveland Public Auditorium, Cleveland

Oct. 7-8—National Foundry Association, 56th annual meeting, La Salle Hotel, Chicago

Oct. 14-15—Michigan Regional Foundry Conference, University of Michigan, Ann Arbor, Mich.

Oct. 14-16—Foundry Equipment Manufacturers Association, annual meeting, the Greenbrier, White Sulphur Springs, W. Va.

Oct. 15-16—Northwest Regional Foundry Conference, Vancouver, B. C., Canada

Oct. 16-19—Conveyor Equipment & Manufacturers' Association, annual meeting, the Greenbrier, White Sulphur Springs, W. Va.

Oct. 18-22—National Safety Council, 42nd National Safety Congress and Exposition, Chicago

Oct. 27-29—Grinding Wheel Institute & Abrasive Grain Association, fall meeting, Edgewater Beach Hotel, Chicago

Oct. 28-29—Purdue Metals Casting Conference, Purdue University, Lafayette, Ind.

Oct. 28-29—All-Canadian Foundry Conference, King Edward Hotel, Toronto, Ont., Canada

Oct. 29-30—New England Foundrymen's Association, New England Regional Foundry Conference, Massachusetts Institute of Technology, Cambridge, Mass.

Nov. 1-5—American Society for Metals, National Metal Congress and Exposition, International Amphiteater, Chicago

Nov. 3-4—Investment Casting Institute, fall meeting, Congress Hotel, Chicago

Nov. 3-5—Steel Founders' Society, annual technical and operating conference, Carter Hotel, Cleveland

Nov. 10-12—Industrial Management Society, 18th annual time and motion study and management clinic, Sherman Hotel, Chicago

Nov. 11-12—Gray Iron Founders' Society, annual meeting, the Homestead, Hot Springs, Va.

Nov. 15-17—Magnesium Association, 10th annual meeting, Hotel Chase, St. Louis

Dec. 1-4—American Institute of Mining & Metallurgical Engineers, electric furnace steel conference, Hotel William Penn, Pittsburgh

1955

Feb. 10-11—Wisconsin Regional Foundry Conference, Schroeder Hotel, Milwaukee

Feb. 14-17—Industrial Ventilation Conference, Michigan State College, East Lansing, Mich.

Feb. 17-18—Southeastern Regional Foundry Conference, Tutwiler Hotel, Birmingham

Mar. 9-10—Foundry Educational Foundation, college-industry conference, Hotel Cleveland, Cleveland

Mar. 14-15—Steel Founders' Society, annual meeting, Drake Hotel, Chicago

Mar. 26-27—California Regional Foundry Conference, Ambassador Hotel, Los Angeles

Mar. 28-Apr. 1—American Society for Metals, ninth Western Metal Congress and Western Metal Exposition, Pan-Pacific Auditorium, Los Angeles

May 23-27—American Foundrymen's Society, 59th annual convention, Houston, Tex.

June 16-18—Malleable Founders' Society, annual meeting, the Greenbrier, White Sulphur Springs, W. Va.

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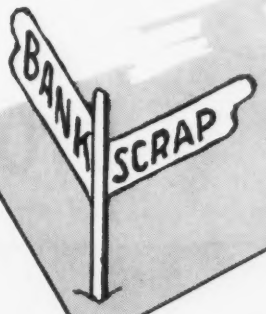

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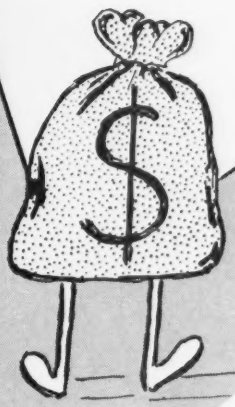

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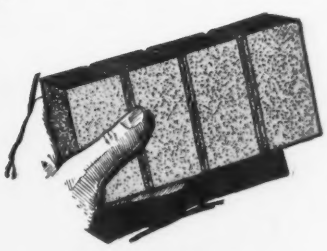

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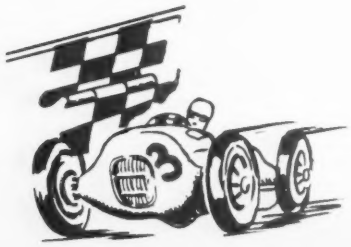

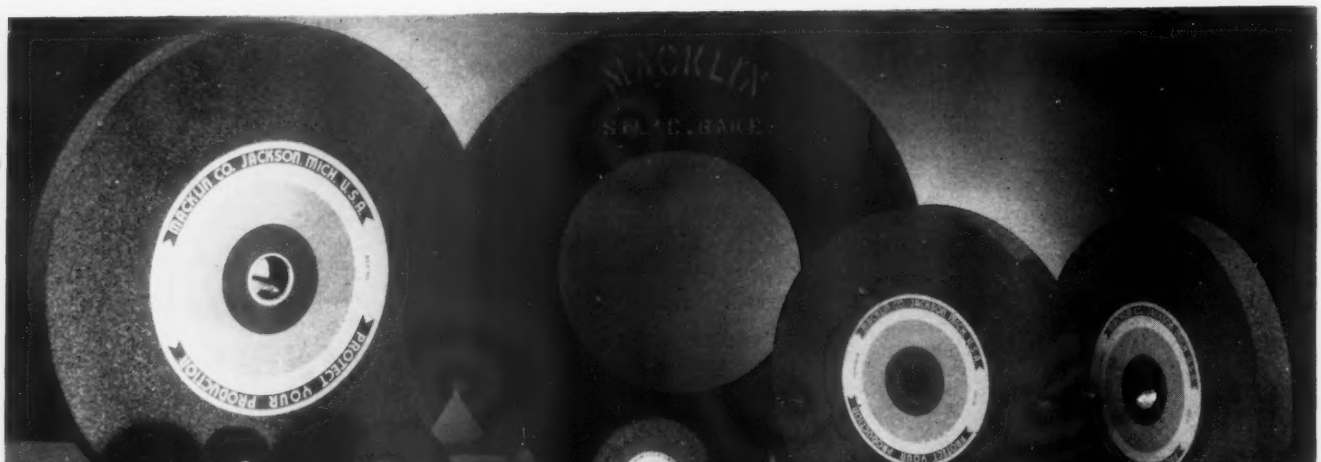

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AROUND THE COUNTRY

NEWS REPORTS FROM

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CAST Iron Soil Pipe Institute, representing over 80 per cent of the industry, is establishing rigid quality standards for its products. The purpose is to eliminate substandard products, promote interchangeability, reduce production and distribution costs and protect producers' reputations.

Pipe and fittings now are standardized into two weights, against four weights formerly. Specified weights, dimensions, patterns and testing procedures must be conformed with before the institute's interlocking "C.I." seal may be used.

The institute gives two main reasons for its move. One is that subquality products in some cases were giving the industry a black eye and hurting its competition with other materials. The other is that marketing areas of producers overlap more than they used to. This makes it desirable that dimensions and tolerances be uniform if pipe and fittings are to be interchangeable.

Los Angeles . . .

Foundrymen's fears that slackened summer activity would extend into fall have not been realized. For most shops, September was at least as good as any other month this year, and much better than July and August, when the summer slump was most noticeable.

The improvement is attributed to reduced inventories held by castings consumers. When inventories were down in spring and early summer, casting sales soared. Now inventories have been worked down again due to unexpected special jobs. Most shops report inquiries are coming fast again, after a 25 per cent drop in August.

Foundry melting rates average 90 per cent, better than the first half average of 85 per cent. Some operators report melting rates near 100 per cent of capacity, but emphasize that special jobs are responsible for the increased rate.

A sudden rise in special jobs forced some steel foundries in this district to work double shifts for several weeks. During this time, foundry scrap purchases soared and prices on No. 1 cupola cast firmed at $45. Some scrap dealers credited foundry purchases with giving the market its biggest boost of the year.

Backlogs range from three to five weeks for most shops, with several steel foundries reporting seven weeks on special jobs. Although backlogs at this time last year stretched to six weeks, foundrymen are satisfied that current backlogs are sufficient to see them through the third quarter with ease. One foundryman, reporting that casting requirements appear to be rising faster than they dropped during the summer slump, expects fourth quarter activity for his shop to exceed any previous quarter this year, and possibly to equal his best quarter of the past two years.

With West coast aircraft plants operating in high gear, castings for new airplane designs are being ordered continually. Magnesium foundries report their sales volume has climbed 10 to 15 per cent in the past month from stepped-up orders by planemakers.

Chicago . . .

FOR the second straight year the Wisconsin State Fair held at the fairgrounds in Milwaukee, Aug. 21-29, featured a model foundry and machine shop manned by apprentices. Housed in the Wisconsin-at-Work building, the project was sponsored jointly by the Wisconsin Manufacturers Association and the Wisconsin Industrial Commission.

Seven years ago the Wisconsin-at-Work exposition was started as a permanent feature of the fair. Four years ago, the training of apprentices became a central theme and last year the operating foundry and machine shop was installed to provide a practical example of such training. The venture proved popular, thus its repetition.

This year the glassed-in exhibit was somewhat more extensive than last. During the nine-day fair period, more than 30 apprentices supplied by 25 member companies of the Manufacturers' Association produced aluminum ash trays which were handed out as souvenirs. The fledgling craftsmen demonstrated making of the patterns, making and pouring of the molds, and finishing of the cast trays.

* * *

Foundry operations in the Chicago area improved some in September and further increase in rate of melt is expected in October. Automotive requirements for castings appear to be the dominating influence. Farm implements and general industrial needs show little change.

Any increase in bookings for castings sends foundry operators into the market for pig iron, coke and other supplies, since practice in recent months has been to hold inventories to the minimum.

Unlike two and three years ago, pig iron order books at the first of the month give little indication of total business volume during the month. This is because so much of current ordering is of spot character. With blast furnace capacity only partially engaged, iron suppliers can make prompt shipment. Several merchant furnaces are idle.

Beyond November, foundry operators are making no predictions on trend of business. It is going to depend, they believe, on the reception accorded new automobile models.

Philadelphia . . .

CASTING orders are slow to pick up. But most foundrymen believe that a turn for the better is under way, even though they can't foresee anything in the way of brisk activity for the immediate future.

Gray iron shops are operating four to five days a week but mostly around four days. Backlogs run two and a half to three weeks. There is little outstanding demand in any one direction.

Most steel foundries are operating at around five days, but with reduced forces. For instance, certain shops on a five-day schedule are operating only seven hours per day. Business is diversified, including fair requirements for automobile trucks, valves and lift trucks. Recent award of 50 steam locomotives to the Baldwin-Lima-Hamilton Corp., Eddystone, Pa., for export to India, will boost the operations of at least one foundry in the production of locomotive frames and certain other components.

Substantially all assets of the

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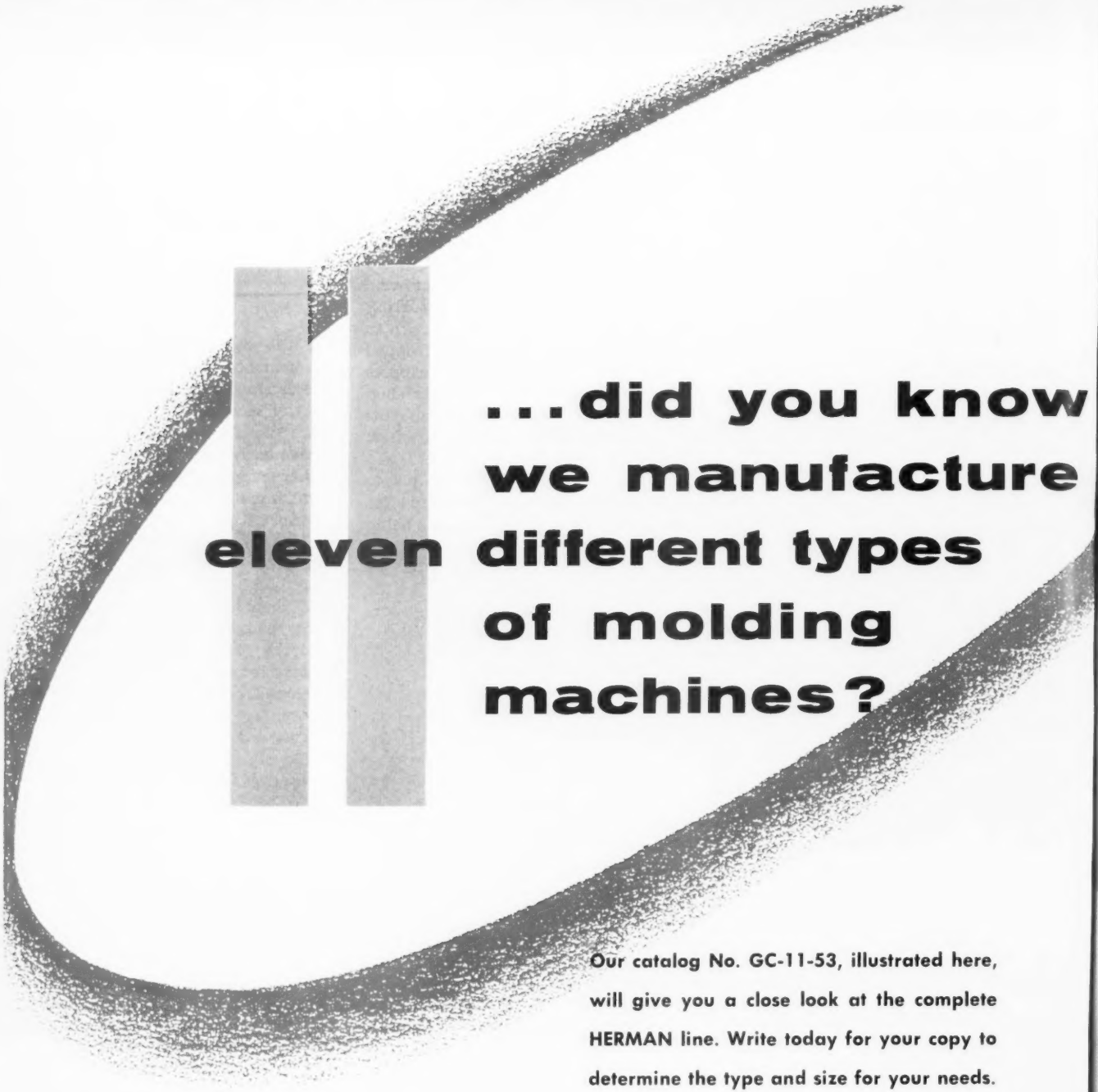

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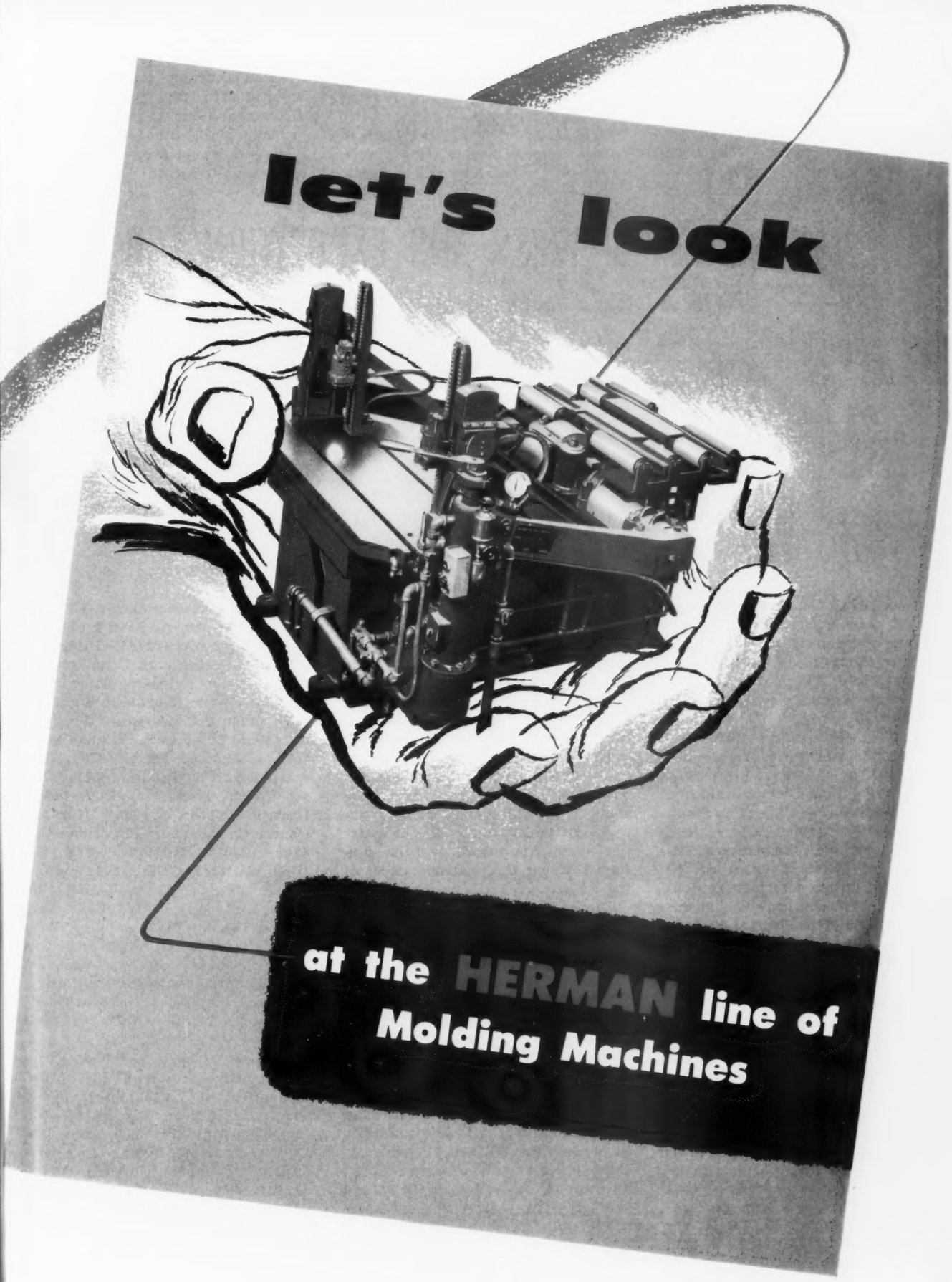

let's look
at the HERMAN line of
Molding Machines

(*Concluded from page* 159)

Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa., have been acquired by Frederick W. Richmond, New York, for $3,970,000. Mr. Richmond is chairman of three machine tool and gear grinding companies, and will, it is said, continue the business of the company with its present plants, management and personnel.

Of the ferrous foundries, malleable shops appear to be moving along best. Little railroad work, which normally is an important outlet, is developing, but there is substantial activity in pipe fittings and a good assortment of other work. With few exceptions these shops are running five days a week,

Brass and bronze shops continue to reflect dullness in shipbuilding work and the lull in ordnance requirements. There are indications, however, that the latter will improve as the fall season gets under way. Good part of the work now being processed is for meters and building hardware. Aluminum casting production has dropped off. Only those engaged in aircraft and radar work appear to be doing well, although not as well as they have. Job shops are operating on a hand-to-mouth basis.

NATIONAL METAL CONGRESS AND EXPOSITION FOR 1954

Will Be Held in Chicago Oct. 30-Nov. 5

DISPLAYS of more than 435 exhibitors will be presented at the 36th National Metal Congress and Exposition at the International Amphitheater in Chicago, from Oct. 30 through Nov. 5. Over 50,000 persons attended the 1953 show, which was held in Cleveland. The Congress will be sponsored jointly, as it has been in the past, by the American Society for Metals, American Welding Society, Institute of Metals Division of American Institute of Mining and Metallurgical Engineers and the Society for Non-Destructive Testing. Each of these groups will present a program of technical papers on subjects pertaining to the activities of their members. The ASM also will offer a lecture course on temperature measurement.

General topics on the ASM program include constitutional diagrams, mechanical metallurgy, processing, hardenability, physical metallurgy, ferrous physical metallurgy, mechanical properties, stainless steels, heat treatment and high temperature. The Institute of Metals Division of the AIME will cover deformation, constitution, diffusion, powder metallurgy and oxidation, metal science, general subjects, titanium, phase transformations and recrystallization and creep. The Society for Non-Destructive Testing will offer an educational program on various types of testing and several papers on ultrasonics. The American Welding Society will present a large number of papers on a variety of subjects.

The annual meeting of the ASM will take place at 9 a.m., Wednesday, Nov. 3. Kent R. Van Horn, Aluminum Co. of America, will present the Campbell Memorial Lecture at that time. Publications and program committee meetings of the IMD are scheduled for Sunday, Oct. 31, at 4:30 and 8 p.m. respectively. The membership committee will meet Monday, Nov. 1, at 4:30, and the executive committee will meet at a luncheon at 12:30 p.m., Tuesday, Nov. 2. On Wednesday, Nov. 3, the nuclear metallurgy committee will gather at 4 p.m. AWS meetings include the following: President's reception, Monday, Nov. 1, at 6 p.m.; national dinner, Monday, Nov. 1, at 8 p.m.; section officers meeting, Tuesday, Nov. 2, 2 p.m.; WRC University dinner and WRC University conference, 6:30 and 8 p.m., Wednesday, Nov. 3, respectively; board of directors meeting and business meeting, 10 a.m., and 2 p.m., Thursday, Nov. 4, respectively.

The Sauveur Achievement Award for 1954 will be presented to Alexander L. Feild, associate director, Research Division, Armco Steel Corp. Purpose of the award, which was established in 1934, is to recognize pioneering metallurgical achievements which have stimulated organized work in similar lines to such an extent that a marked basic advance in metallurgical knowledge has been made. Dr. Feild is one of the country's outstanding authorities on stainless steel. His award will be presented during the annual banquet of the ASM.

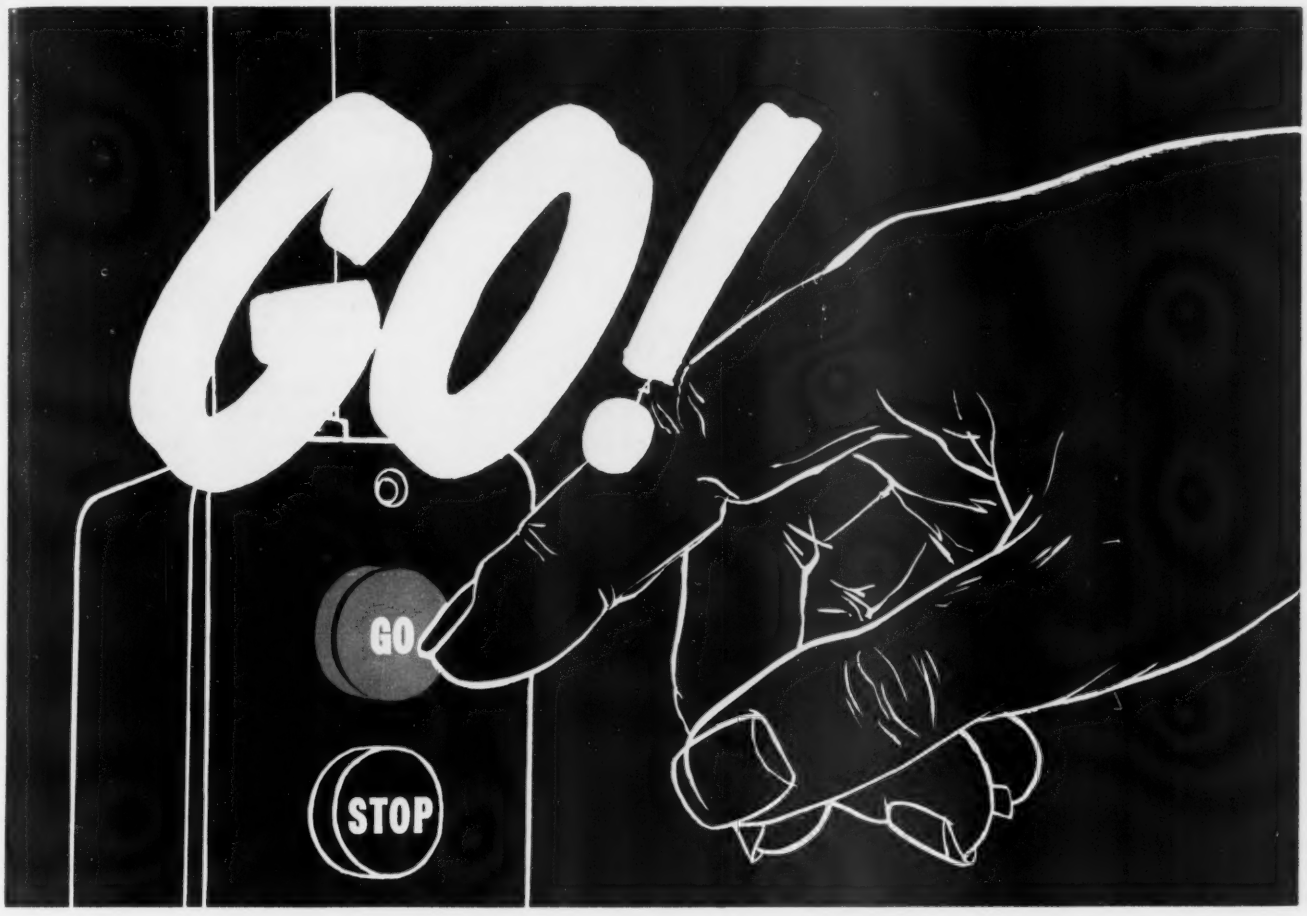
The ASM also will present its 1954 Medal for the Advancement of Research to William E. Umstattd, president, Timken Roller Bearing Co., Canton, O., at the annual banquet.

Newly elected officers of the ASM who will be presented at the annual meeting include the president, George A. Roberts, vice-president, technology, Vanadium-Alloys Steel Co., Latrobe, Pa., and the vice president, A. O. Schaefer, vice president, engineering and manufacturing, Midvale Co., Nicetown, Pa. W. A. Pennington, chief metallurgist, Carrier Corp., Syracuse, N. Y., will start the second year of a two-year term as treasurer. W. H. Eisenman will begin the first year of his 19th consecutive two-year term as secretary of the organization.

Exhibitors will include many foundries, among whom are the following: Al-Fin Division, Fairchild Engine & Airplane Corp., Farmingdale, L. I., N. Y. (2070); Allis-Chalmers Mfg. Co., Milwaukee (242); Alloy Engineering & Casting Co., Champaign, Ill. (1101); American Brake Shoe Co. (and divisions), New York (762); American Cast Iron Pipe Co., Birmingham (1020); American Chain & Cable Co., Bridgeport, Conn.; American Wheelabrator & Equipment Corp., Mishawaka, Ind. (632); Arwood Precision Casting Corp., Brooklyn, N. Y. (1254).

Baldwin-Lima-Hamilton, Philadelphia (1065); Morris Bean & Co., Yellow Springs, O. (2118); Bridgeport Brass Co., Bridgeport, Conn. (1015); Carboloy Dept., General Electric Co. (1540); Casting Engineers Inc., Chicago (1746); Chase Brass & Copper Co., Waterbury, Conn.; Dow Chemical Co., Midland, Mich. (620); General Alloys Co., Boston (652); Gleason Works, Rochester, N. Y. (454); Haynes Stellite Co. (653); Hills-McCanna Co., Foundry Division, Chicago (2301); Hitchiner Mfg. Co., West Hartford, Conn. (1412); Howard Foundry Co., Chicago (1227); International Nickel Co., New York (745); Janney Cylinder Co., Philadelphia (1767); Kolcast Industries Inc., Cleveland (1927); Lynchburg Foundry Co., Lynchburg, Va. (2067); Michiana Products Corp., Michigan City, Ind. (1759); Michigan Steel Casting Co., Detroit (1730).

National Lead Co., New York (260); Ohio Steel Foundry Co., Springfield, O. (1435); Pangborn Corp., Hagerstown, Md. (426); National Radiator Co., Johnstown, Pa. (1911); Precision Castings Co., Syracuse, N. Y. (1430); Precision Metalsmiths Inc., Cleveland (2045); Pressco Casting & Mfg. Corp., Chesterton, Ind. (2215); Rolle Mfg. Co., Lansdale, Pa. (1336); Shenango-Penn Mold Co., Dover, O. (2112); Universal Castings Corp., Chicago (2148); and Westinghouse Electric Corp., Pittsburgh (360).



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Two of the nation's trunk line railroads serve Ottawa Silica Company's transportation needs, assuring you of swift and dependable service.

A two letter word that describes the driving spirit of America — the button our pioneering forebearers pushed, then forgot about the one marked "STOP".

We got that way by doing things right — by hard endeavor — by bringing forth new products and services.

America's foundries have played a critical role in our development. Today more than ever, the foundryman stresses quality in methods and materials. He knows that producing superior castings means no compromise with the ingredients used.

That's why Ottawa Silica Company enjoys a high priority amongst the buyers of all types of foundry sand. They have learned to count on Ottawa's consistent uniformity and purity.

99.89% PURE BY LABORATORY TEST!

When you need shell molding sand, try Ottawa Silica's SIL-CO-SHELL

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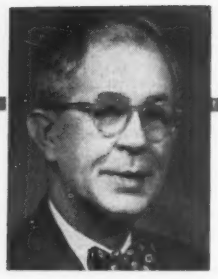

MAN-TO-MAN

By RALPH L. LEE

Getting What's Coming to You

"The old law of conservation of energy applies as well to careers (over the long haul) as to nature's forces and the principles of engineering"

SEVERAL weeks ago, the phone rang, and someone I didn't know said he was a retired foundryman who reads FOUNDRY religiously, including my Man-to-Man column. He wanted to know if it would be convenient for him to come on out to see the Lee Hobby Foundry. When I assured him that he would be more than welcome, he came, and he's been back three times since. I'd be willing to bet that he'll be back many more times in the future, for conversationwise we are covering the foundry waterfront from A to Izzard and enjoying every minute of it.

I feel quite sure that since he sold his foundry and has been well enough off to go and come as he pleases, he's been homesick for the smell of baking cores, the feel of sand and the need to fling his foundry skills about. In the breathing spells between our gab, he's been showing me how to mold the cup, saucer and spoon in green sand while explaining repeatedly that he hasn't had a shovel in his hands for at least fifteen years.

With his coaching I believe that with some luck I could make a pretty fair stab at this tricky molding job, but the truth of the matter is that pride in being able to do it or in advertising the fact was not my greatest interest in this exciting new friendship.

Here is a man who has never done anything but foundry work, having served his apprenticeship as a kid. He started from scratch as a molder's helper and with the sweat of his brow worked his way to ownership of his own foundry and financial independence. Now that he has reached his goal, he feels pretty much lost without the work it took to get him where he is.

I'm sure he wasn't kidding a bit when he told me several times that he enjoyed his four afternoons fooling around the Lee Hobby Foundry more than any others since he sold his business. I couldn't help but think what a pity it is that in far too many cases it takes a whole lifetime to discover that work is not just a means to an end, but the end itself.

What a hell on earth it must be to dread going to work each morning and begrudging every minute spent at it! This, to my way of thinking would be the nearest thing to plain unadulterated slavery there possibly could be. And the most pitiful thing about this slavery is that in nine cases out of ten it is self-imposed.

It's not the system that does it, not bad luck, exploitation or anything else from the outside. Fundamentally it is a matter of personal point of view from the inside. It's a matter of the stand we voluntarily take toward the subject of work.

This past week I've been putting in at least twelve hours each day working in the Lee Hobby Foundry at a pace no employer could possibly expect his people to match. There haven't been enough hours in the day, and the hands of the clock must have whizzed around like crazy, although I haven't had time to look. I have had one wonderful time.

The job I've been working on turned out far better than I expected. But even if it hadn't, I'd still have had a good time doing the things I have learned how to do and some that I hadn't—using my tools, materials, skills, experience, head, hands and back. The sensation of enjoying all of these satisfactions and of losing myself while doing it was the real payoff, with the splendid outcome of the job just an extra dividend—sort of a bonus.

If young people at an early age would stand up on their own hind legs and fight for their rights—that is, their right to get satisfaction for the time they have spent out of every job they undertake, I'm sure there wouldn't be nearly so many career problems or so many disgruntled and frustrated clock watchers fighting on the wrong fronts.

A person has to be almost ready for the scrap heap before he realizes that every life is an unbroken chain of connecting links of NOWS. NOW is the only time a person can do anything, good, bad or indifferent about anything. NOW is the only time a fellow can be happy, contented or miserable.

So it begins to add up to me that if we've got a job to do, we're committed to it, and there's no escape from it until it's done. Why should we squander these priceless NOWS, these pieces of our life that are definitely numbered, in half-hearted, air-fanning bellyaching, clock-watching slavery when with a switch of viewpoint of only a few degrees, we can be free to make a game out of what we've got to do and get some satisfaction back out of it?

The funny thing about this self-hypnotising trick is that the work done as a result of it is bound to be much better than the average, that credit for this higher quality is cumulative, in terms of satisfaction, reputation and every other form of pay. Those who master it invariably are the ones who are lucky when it comes to the breaks, frequently to the amazement of the much smarter and better schooled clock watchers.

It begins to look as though the old law of the conservation of energy applies as well to careers (over the long haul) as it does to nature's forces and the principles of engineering. Input is always plotted against output as an indisputable measure of accomplishment. Between these two are the losses—hysteresis, resistance, friction, heat loss or evaporation—each of which has it's counterpart in the performance of the individual, with input of course sort of a base line.

I am convinced that God intended us to get our NOW'S worth in satisfaction out of every worth-while thing we do and that He has equipped us with the wherewithall to manage the trick, provided we have our heads screwed on straight. And by the way, it could be that we don't have to be too young to get on to it. At least, that's the way it seems to me.

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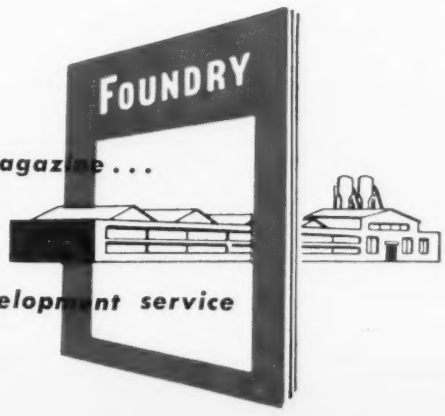
PLUS 5 SERVICE

to put extra push behind your sales program

What is PLUS 5? It's your key to more business from foundries. It gives every FOUNDRY advertiser a bonus he can get from no other source. Here is help in analyzing this market—studying sales territories and potentials—planning the sales effort—and creating a constructive promotion program to the 5 billion dollar foundry market. It's time to take a new look at this market—and at the unusual selling aids we have for you. Say PLUS 5 to your FOUNDRY representative and he'll show you this 5-step program designed to move more of your products into foundries.



More than a magazine . . .

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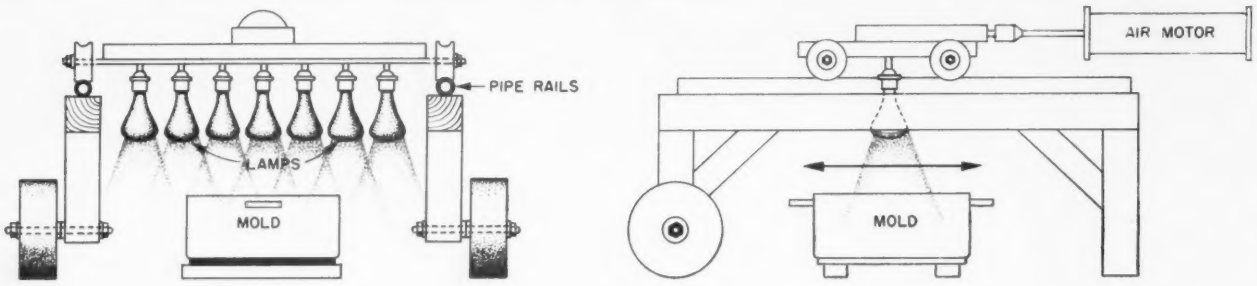
By C. W. AMMEN



This device will do a good job of mold drying. Basically, it consists of a beam to carry heat source, suitable rails and reciprocating drive

Casting and Finishing Bronze Plaques

DEAR CHARLIE:

I've been having some trouble with brown spots on the faces of plaques and tablets we are called upon to make occasionally. Sometimes we have very good success, but often we get discolorations and holes which look like misruns in or near the center. I have lots of trouble getting an even patina, and the patina will not cover the spots. How about some dope along these lines? How about this patina business. Can I use anything besides the usual hot solution of liver of sulphur?

SAM

DEAR SAM:

Will take her in rotation. Close examination of the plaque section you sent leaves no doubt that these brown spots are what is known as heat-deposited chemical patina, caused by your facing sand. Have seen many of these spots—including green, yellow and orange ones.

Patina is a carbonate or oxide of copper and was applied at one time by burying the object in different types of soil for long periods of time. The soil type was chosen carefully to give the desired color effect. Patina also was applied by women who rubbed the object back and forth over their skins for long periods. The patina thereby was produced from the action of the fatty acids secreted by the skin.

Have seen some nice work scrapped because of these patina spots. A facing sand containing excessive magnesium, aluminum, caustic soda, saltpeter, salt or zinc sulphate will cause them. So will a sand with too much rotted vegetable matter, which drops out fatty acids when heated under the proper conditions. The cause is a chemical reaction between a hot casting, chemicals and elements in the molding sand. Copper base castings are quite susceptible to artificial patina when they are at a red heat. At shakeout, such a casting at once takes on a black copper oxide patina, as do the tops of sprues. Another thing to watch is the presence of lime. In excess of ½ to 1 per cent, lime will cause a rough surface difficult to remove.

Most patina spots deposited from facing sand are very thin and light and can be removed by pickling or by blasting with a fine polishing sand. Spots of the type you have are very difficult to remove and will not take an applied patina over them very well. Change your facing sand, and the spots will leave you. Impurities in your facing sand cause 90 per cent of these patina spots. More dope on patina a little farther on.

Now, about the holes in or near the center. In most instances, and as I believe these to be, they are caused by a sagging cope. This saucer effect causes the metal to fill the heavy section first and to skirt the tight spot until the metal is too cold. I have seen this trouble in making even small nameplates which were poured very hot. They were made in a snap which was too small and left insufficient bearing surface around the job, allowing the cope to sag—and not much of a sag will cause the trouble. A nameplate ¼ x 3 x 9 in. made in a snap should have at least 4 in. of sand all around the pattern as a bearing. It is best to use steel or iron flasks with lots of bars and to give yourself lots of bearing surface all around. Rigidity is very important. When weighting down and clamping the cope, be careful. Casting of plaques, bas reliefs, tablets and the like takes a great deal of patience and practice.

Equipment for making this kind of work must be first class. The flask equipment should be large enough, rigid, well matched and fitted up with a good, clean, even bearing surface completely around the joint. Bottom boards must be extra heavy and very rigid and fit closely. Avoid copes and drags that are too shallow.

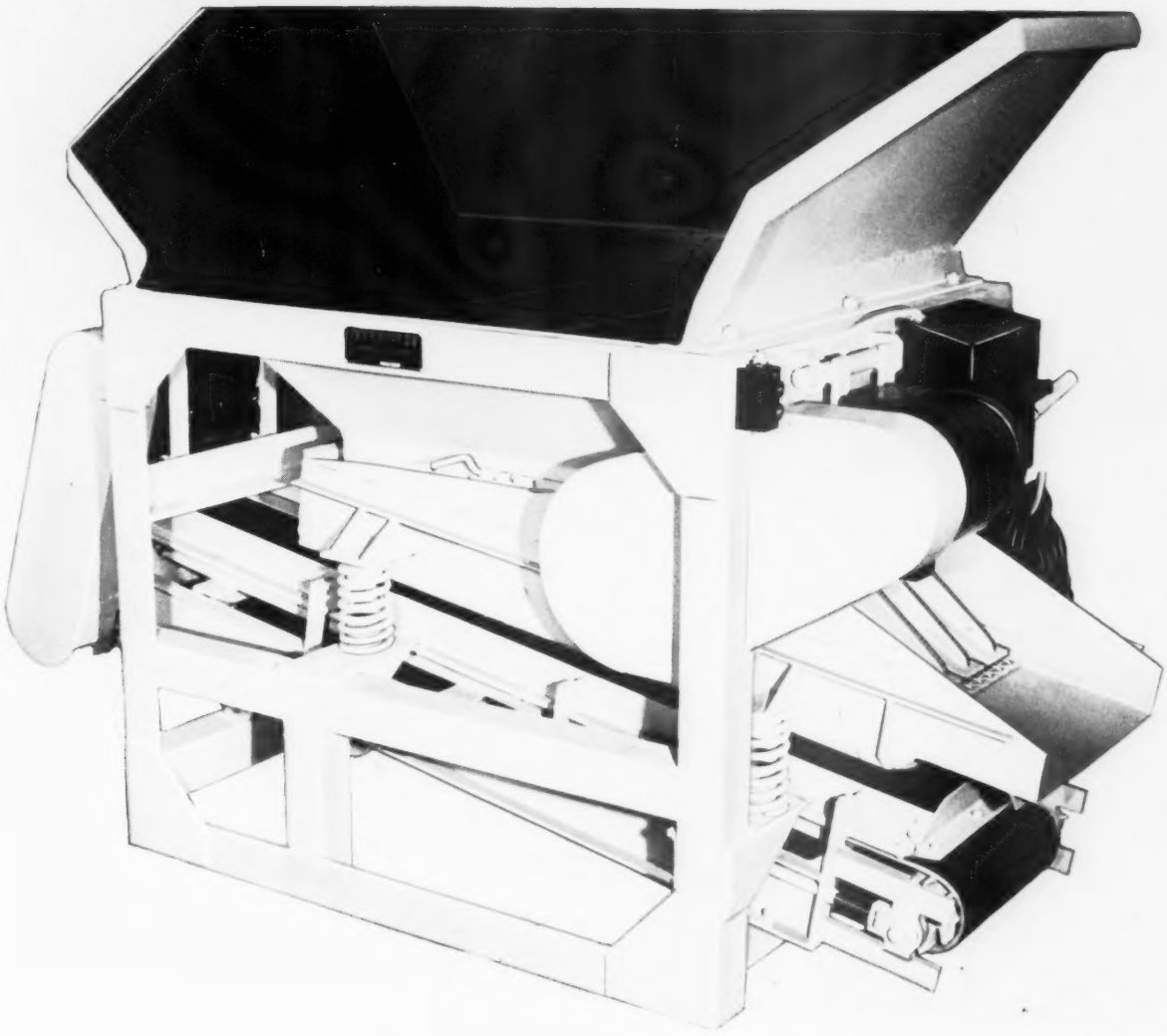
Facing sand must be good, clean sand free from any tramp material. The sand used by most shops doing this class of work is a fine grade of Albany, Windsor Locks, imported French or prepared sand. The last is a sand which has been treated to remove the organic and foreign matter and has been ground and screened. Prepared sands made from zircon and Carbosand are very fine for this class of work. Carbosand is a highly refractory material produced in an electric furnace by fusing at a high temperature a mixture of petroleum coke and natural silica in its purest form. It must be ground and bonded with bentonite or a suitable clay before use. Zircon also must be bonded.

Because these are fine sands with low permeability, it is recommended that they be used only as a facing and be backed up with more open sand. A plaque or tablet of any size gives the sand next to its surface a real cooking. A small percentage of very fine wood flour will help to control sand expansion.

You can make up a dry sand facing bonded with flour, core oil or a prepared binder. A common facing

(*Continued on page* 169)

FLOOR MOUNTED... *no pits required for the* NEW "60" PREPARATOR



NEW MACHINE DESIGNED FOR USE WITH ANY FRONT-END LOADER

The new "60" Preparator—designed for use in B&P Speedmullor-Preparator Units—completely conditions up to 40 tons of molding sand per hour, and can be installed without pits of any kind. This one "most needed" feature would make the new "60" Preparator big news, but look at the other new features:

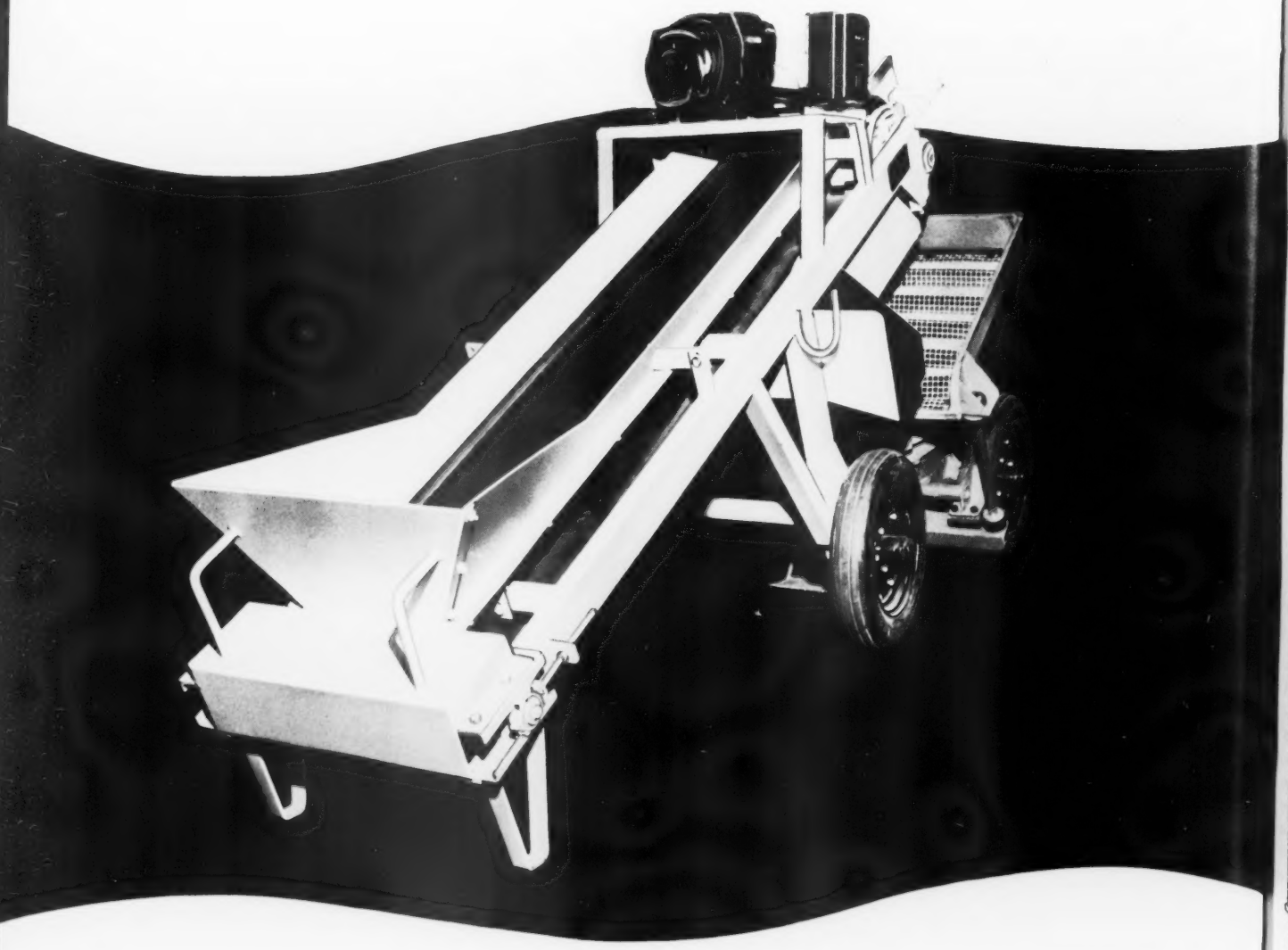
1. 50% greater loading hopper capacity—no waiting to load.
2. Flush-sided construction permits easy loading.
3. Loading height only 4'-2"—low enough for any loader —no ramps required.
4. Permanent magnet separation—no tubes, no rectifiers.
5. High-capacity high-frequency screening—new performance records.
6. New lump breaker—more effective handling of lumps.
7. Also available in a portable model.

For rugged construction and dependable performance, it's the new "60" Preparator. Write now for full data . . . *Beardsley & Piper, Div. Pettibone Mulliken Corp., 2424 N. Cicero Avenue, Chicago 39, Illinois.*

HERE'S THE NEW PORTABLE

MAGNAVEYOR

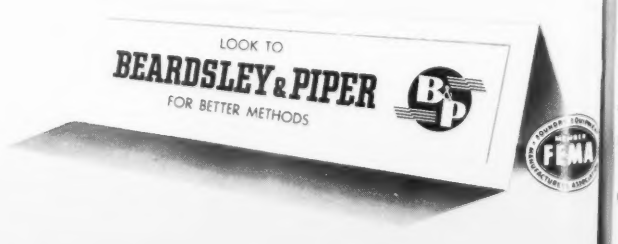
to improve your casting surface



The Magnaveyor is a sturdy new belt loading unit with a dependable permanent magnet separator, built by Beardsley & Piper to meet a definite need for better foundry sand preparation.

The Magnaveyor loads a B&P Screenarator, or other conditioner, at a rate of up to 1500 pounds per minute, and completely separates iron scrap, shot, and wires and nails from the sand being loaded. It is highly portable and may be easily moved by one man from foundry floor to floor. It is easily and quickly placed in operation with a Screenarator, or other device, and appreciably increases the efficiency of the conditioning unit with which it works.

A small knee-high hopper for shovel-loading makes the Magnaveyor particularly convenient for side floor sand preparation. Once you try it your molders will never want to do without it. Write now for information. *Beardsley & Piper, Div. Pettibone Mulliken Corp., 2424 N. Cicero Avenue, Chicago 39, Illinois.*



(*Continued from page* 166)

consists of 20 parts sand to 1 part dry lignin sulphite, skin dried.

You can print back after dusting with flour, talc or Hi Earli cement and pour as is. A safer method is to spray the surface with a spray made of lignin sulphite, molasses water, silicate of soda, core oil, rubber cement cut with benzine, a prepared spray or aluminum paint; then skin dry. If the spray is sticky, do not spray before printing back. Hi Earli cement will produce amazing results when properly dusted on and printed back. The use of aluminum paint produces a very smooth casting with an aluminum color which is very thin and easily removable. The aluminum paint must be the type in which the binder and the pigment are in separate containers or a double-ended can. It should have a banana oil binder and must be skin dried. The spraying and skin drying are to provide additional bond and to remove moisture.

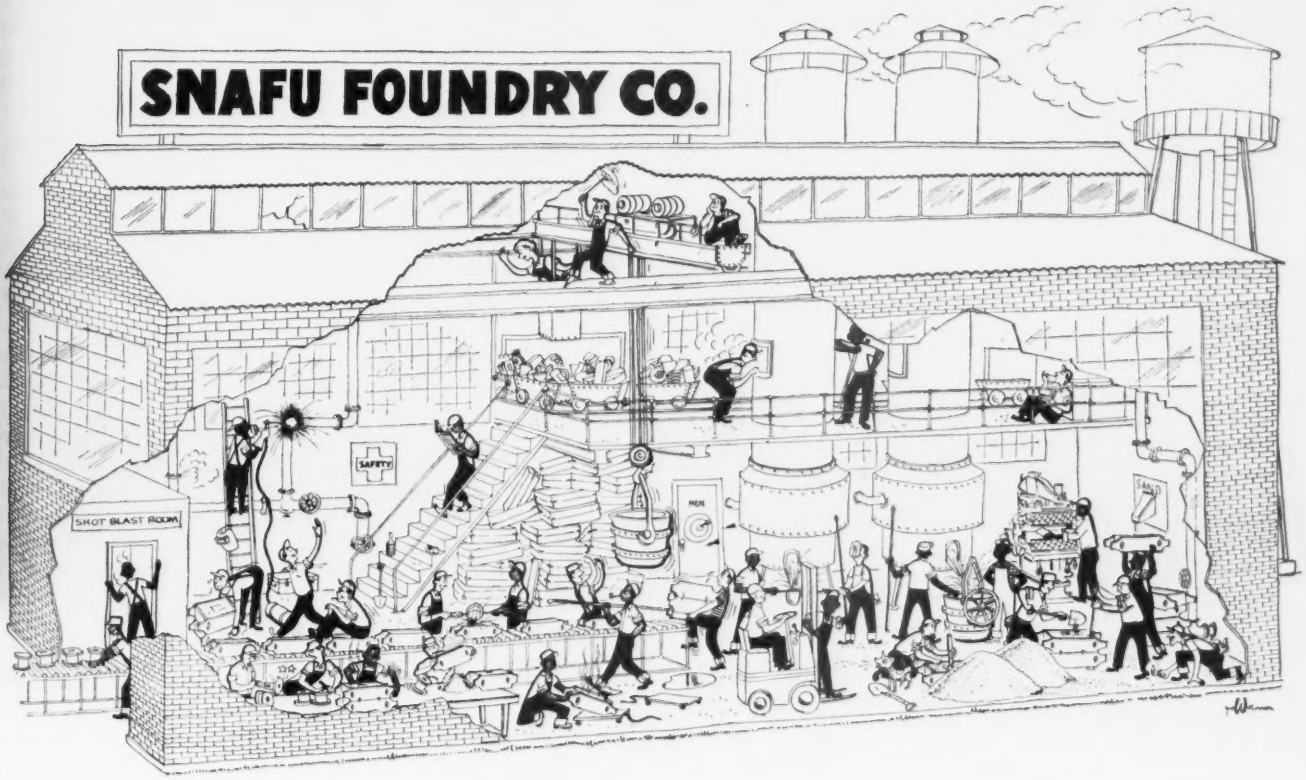
When molding, be very careful to use dry parting sparingly, and be sure not to leave any accumulation of parting on the pattern and to watch for little pockets, etc., which tend to cause accumulation. When possible, use a liquid parting. Some good ones are on the market. A mixture of 1 part bay berry wax and 1 part petroleum jelly dissolved in gasoline makes a good parting for fine work. It should be brushed on the pattern very thinly with a soft brush.

Most liquid partings will soften and in some instances melt fillet wax. Lycopodium powder is considered the finest dry parting available. It is a natural parting and is unsurpassed for ornamental work. Relatively expensive, it is very light and fluffy, and a small amount goes a long way. Needless to say, the mold must be made by an experienced molder and be firm, but not too hard, with no ramaways, stickers, cracks. Lift must be good and clean.

A guide bar which will fit the flask pins can be slipped down over the pins on the drag and be screwed in several places to the pattern. It can be used to assist in making a clean lift and return. A good roll-over draw machine also can be of great help in producing a clean, straight lift. If loose, general practice is to place some straight welding rods, two at each corner, stuck into the drag, for use as guides in lifting and returning to print back. This print back is not always necessary, and lots of good, clean jobs have been made without it. You will have to decide which method suits your system and works best.

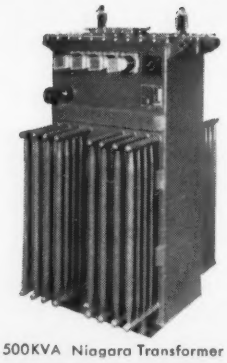
Gating usually is dictated by the size and type of job being made. Rules are not set, and each man will

SAFETY CONTEST UNSCRAMBLES SNAFU'S FOR CASH

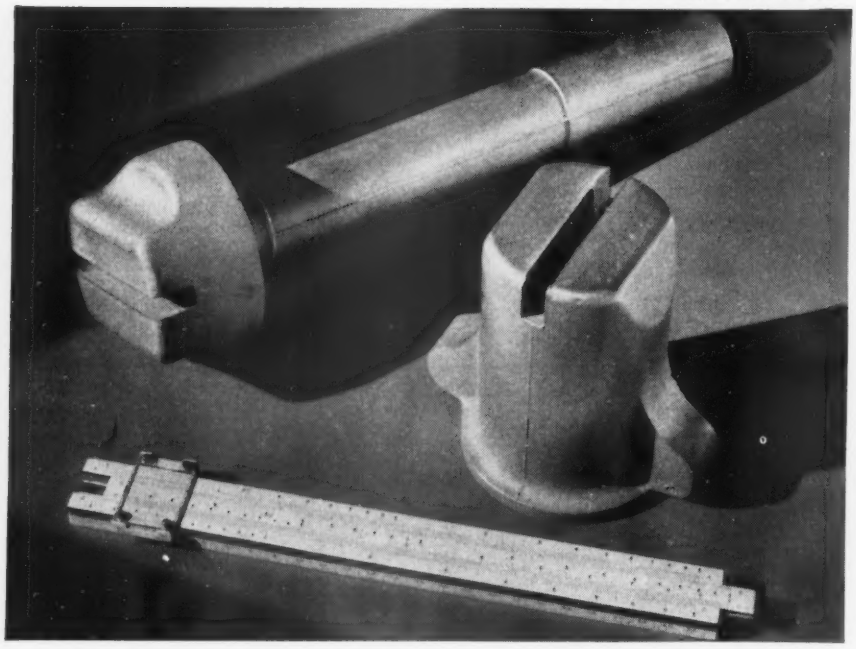


ELEVEN safety-minded employees of American Brake Shoe Co. have been awarded cash prizes in a Snafu Safety Contest recently conducted in the company among its 9000 employees throughout the United States and Canada. Contestants were asked to discover as many unsafe conditions or acts as possible in a cartoon (reproduced above). The cartoon presented several hundred safety hazards and conditions which conceivably could be found in a foundry. Plus giving the total number of hazards, contestants were asked to describe the conditions or hazards in such a way as to indicate their knowledge of proper safety rules governing each situation. Several hundred entries were submitted from employees at each of the company's 58 plants. Final decisions were made by safety personnel in the company's New York headquarters. Cash prizes totaling $155 were awarded. A first prize of $50 went to Tom Cunningham, Brake Shoe & Castings Division, and second prize of $30 went to William Ahrens, Kellogg Division. Dorothy Rekiere, a nurse, Brake Shoe & Castings and Southern Wheel plants, and Fred Ezor, National Bearing Division, tied for third place and both were awarded $20. Prizes of $5 each went to seven runners-up.

SHELL MOLDING proves better with HIGH CONDUCTIVITY COPPER



500KVA Niagara Transformer



...higher production, lower cost are among outstanding results

Shell molds bonded with Durez resins are used with great advantage in progressive foundries such as Metal & Alloy Specialties Co., Inc., Buffalo, N. Y., who cast these low voltage high conductivity bushing parts for Niagara Transformers made by Erie Electric Co., Inc.

Rate of production is *several times greater* than with green sand casting. A better metal yield is obtained—there is less scrap—smaller gates and risers are used and less machining is required. One part costs 15% less, the other 30%.

CUSTOMER says —"We have fewer rejects with these shell molded parts. The product has excellent uniformity —it meets our high standards of density and freedom from air bubbles or spaces that would interfere with electrical conductivity."

We can help you — Our very thorough experience in working with leading foundries is yours for the asking. Write us. Be sure to ask for the authoritative "Durez Guide to Shell Molding" — 14 chapters of information you can use.

DUREZ

PHENOLIC RESINS

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Phenolic Resins for the New Competitive Era

swear that his own system is the best and only way. Wedge gates in the cope and a side runner with ingates are equally popular and will produce good results when properly made. A very large, flat surface might necessitate the wedge gates in the cope to cover the area quickly with hot, fluid metal. The basic idea is to fill the mold as rapidly as possible with a minimum amount of nozzling, turbulence and hydraulic shock. Provide dirt traps and chokes where needed, avoiding sharp corners and edges. Ingates should be placed where the metal coming in will not impinge directly on any projection on the mold face. Both cope and drag should be vented very well, with care taken not to hit the pattern with the vent wire—½ in. usually is close enough. Weight down the cope just sufficiently to prevent its lifting. Take time, use the old standby formula, and don't guess.

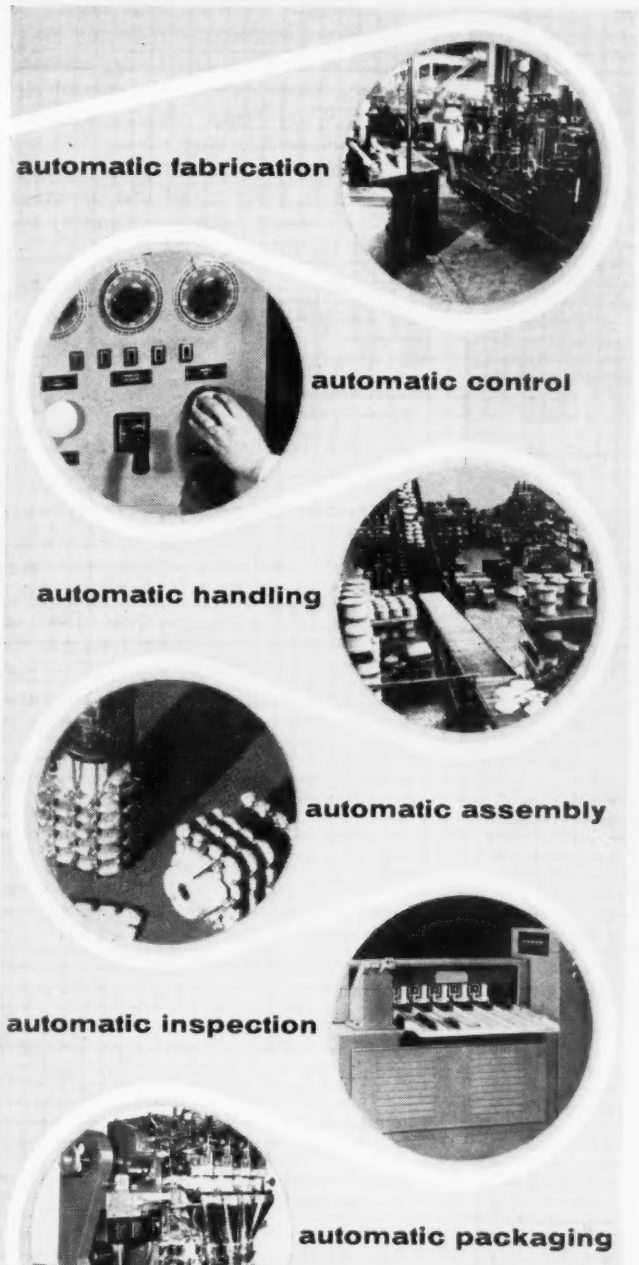
Can Ruin Mold

Even with the best of care, a good mold can be ruined beyond repair during skin drying. A torch in the hands of any one other than a very experienced man who has had a lot of experience in skin drying is almost sure death. Torching molds can be learned only by actual experience, and some very good molders never quite get the hang of it. Use a long, lazy, soft flame and keep the torch moving at all times. Do not scorch the face or burn any edges.

The sketch shown here is of a simple, inexpensive device which will do a nice job. It consists basically of a beam which carries the lamps or gas heater and of suitable rails, with a reciprocating drive to move the beam back and forth. Distance it covers is limited, of course, by the length of the rails and the reciprocating drive. The rig shown in the sketch consists of a single row of 110-v, reflector-type, 250-w infrared lamps mounted on 6-in. centers and moved by an air motor. It was adjustable from 2 in. above the mold joint to 12 in. away from the joint. Two inches away seemed to be the best spot and gave very even skin drying.

The sketch is rough, but it will serve to give an idea of how to build such a device if you should so choose. It was built to dry a large table with infrared lamps when we did not have enough lamps to cover the area to be dried. Consequently we did it with a single row. It also was used from time to time to

(*Continued on page* 172)



new ways of doing things
automatically-
a challenge to every
industrial operation

a challenge

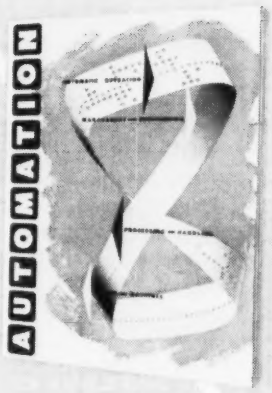
—to management and engineering executives in all industry who must make more goods, for more people, at lower cost.

A challenge, too, to these executives in companies making products and plant equipment that must be made more automatic.

And finally, a challenge to consulting engineers recommending and specifying machines and equipment for automatic operations.

These men—the planners and doers of this big and growing market look for the answers to the challenge in the pages of the one magazine that deals authoritatively with all parts and phases of automatic operation—everywhere.

AUTOMATION



In the October issue you will find a dozen more articles including the following:

- Pushbutton Manufacturing—*C. Tice*
- Hydraulic and Pneumatic Servos—*R. Hadekel*
- Continuous Weighing of Solids—*Robert H. Berg*
- Layout for Handling—*Seth G. Atwood*
- Automatic Assembling for Low Budget Jobs —*Ralph Behrend*
- Data Conversion from Analog to Digital Form—*Staff*

A Penton Publication

PENTON BUILDING, CLEVELAND 13, OHIO

SAVE enough in direct LABOR COSTS within ONE YEAR to repay the complete original investment of Dietert-Detroit AUTOMATIC SAND TEMPERING and AUTOMATIC CYCLING equipment

In addition, many indirect benefits (fewer drops—better casting finish—minimum porosity—lower scrap losses—increased production—a cleaner foundry) are made possible.

Dietert-Detroit Automatic Sand Tempering and Automatic Cycling Equipment will allow you to achieve control in this order—

Batch No.	% Incoming Moisture	Sand Temp., Degrees F	% Outgoing Moisture
1	1.0	70	3.8
2	.6	70	3.9
3	.45	110	3.8
4	.3	130	3.8
5	.35	165	3.9

Every foundry is fighting ever mounting costs and shrinking profits. Investigate the cost reducing possibilities offered by Dietert-Detroit Automatic Sand Tempering—Cycling—Bond Addition and Sand Distribution Equipment.

WRITE FOR ADDITIONAL INFORMATION

HARRY W. Dietert COMPANY

CONTROL EQUIPMENT
SAND · MOLD · MOISTURE
CARBON · SULFUR

9330 ROSELAWN AVE. · DETROIT 4, MICHIGAN

(*Continued from page* 170)

skin dry small molds, cope and drag, at the same time, and to dry mudded cores. These cores were spread out under it on trays instead of being returned to the core oven.

To pour tablets and plaques, pour clean, hot, lively metal and use clean ladles. Some common mixes are listed in Table I.

TABLE I—METAL COMPOSITION

	% Cu	% Sn	% Zn	% Pb
Statuary	90	7	3	
Tablets	90	2.5	7.5	
Yellow tablets	79	1	20	
Govt. standby	90	5	5	
One of the best.....	88	6	3.5	2.5
Run of mill work...	85	5	5	5

Chasing and Coloring—The process of finishing a casting is known as chasing. A piece which has not been chased properly will not produce a first-class job, regardless of the patina. The usual tendency is to rush the chasing in order to get on with applying the patina, but take your time—don't rush the chasing operation. First, clean the casting, removing all sand with a very fine polishing sand blast at low pressure. A good dip for removing particles of sand is made of 1½ gal muriatic acid, 1 qt nitric acid and 2 qt water. Add the acids to the water. Never add water to acid. Doing so produces a violent, dangerous reaction.

Immerse the casting in this solution until it is clean; then rinse it in cold water. Holes to be plugged must be drilled out and counter bored. The small hole is threaded. Chasing stock should be cast from the same heat. A few rods cast for this purpose will suffice. Some shops cast a few plating anodes from the same heat to use to plate the casting, if necessary. The rods cast from the same heat are pickled, cut and threaded as needed. They are screwed into the defect and cut off above the counter bore, then peened into the counter bore like a rivet, leaving some stock to be trimmed flush and burnished. A good job will be invisible, and, because the rods are cast from the same heat, the color will match.

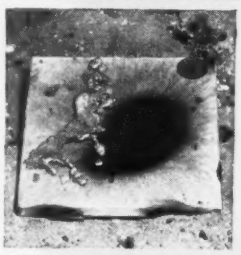
Take care that plugs and holes are clean. Leave no moisture, grease or other substance which could work up through the joint and affect the final patina. Chasing rods should not be used to braze because the process of brazing will change their composition and color. If the color of the casting is poor, the casting can be saved by brass plating it with anodes cast from the heat or with a cast anode containing 65 per cent copper and 35 per cent zinc. Sheet

(*Continued on page* 174)

THE new RIMCO squeeze BOTTOM and pattern BOARD

FIRE RESISTANT AT 2900° F

2900° F. molten iron.



Hot metal after three minutes.

Surface scarred but undamaged.

LASTS MORE THAN TEN TIMES LONGER

Warp-Free — Smooth Surface — No Deflection
Fire-Resistant — No Burn-outs — Use Both Sides
Lower Cost Per Mold — All Sizes

RIMCO Squeeze, Bottom and Pattern Boards are surfaced on both sides with specially-processed RESINWOOD—the outstanding industrial hardboard. Designed to withstand intense heat and pressure, RESINWOOD'S superior construction is now available to the foundry in these high-density, durable Bottom Boards. Over 85 years of experience support the development of tested and proven RIMCO Bottom Boards.

FREE SAMPLE . . .

Send today for a free sample of this amazing RESINWOOD facing. Test it in your own foundry. See how the processed RESINWOOD stands up under 2900°F. molten metal. You can be sure of lower production costs with the RIMCO BOTTOM BOARD.

NOTE: Foundry reorders state that RIMCO is "the best squeeze board on the market."

QUALITY Since RIMCO 1868 MILLWORK

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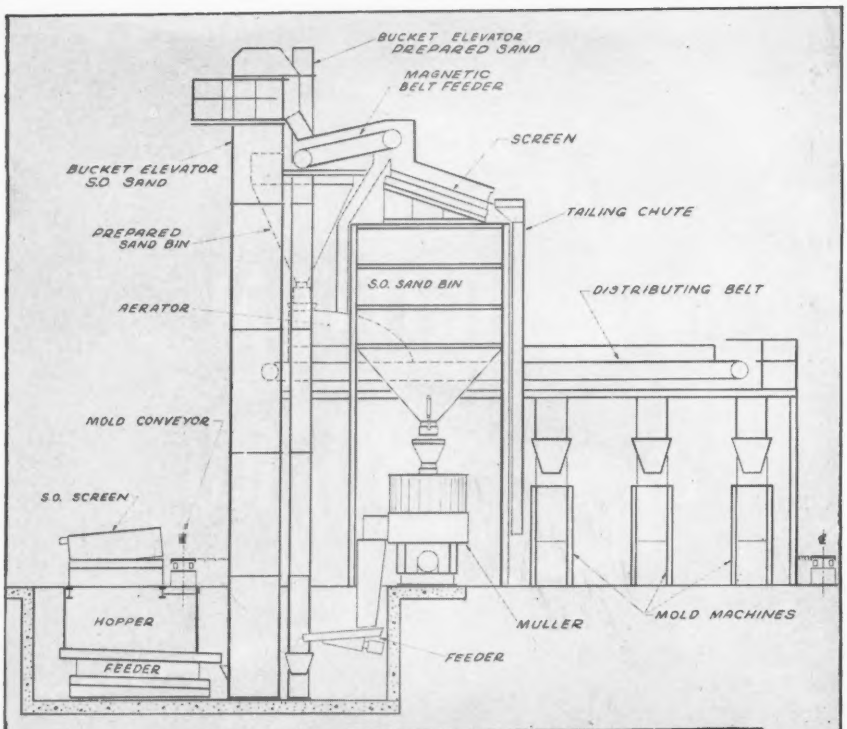
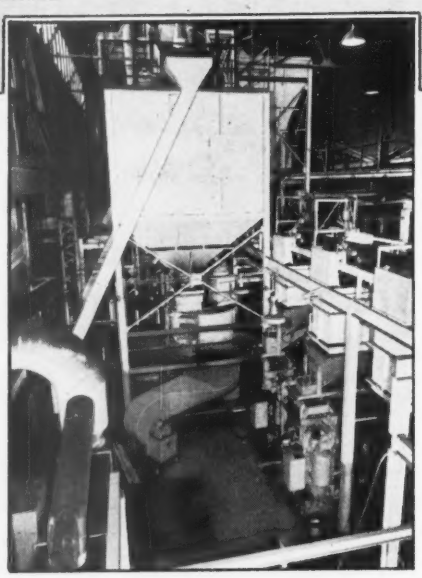


Complete PLANET engineered system at AMICO



At Albion Malleable Iron....

Peak Production in 66'x26'

(FLOOR SPACE)

This PLANET system at AMICO furnishes up to 58 T.P.H. of prepared sand, permits excellent quality control, and provides lower handling costs.

PLANET manufactured components include a 150-ton sand bin, sand preparation system, sand distributing conveyor, hoppers, mold conveyor, overhead pouring rails, shake-out and return sand system.

It's good business to follow AMICO'S example and "Plan with Planet", because a *mechanized* foundry is a more *profitable* foundry. WRITE OR PHONE TODAY . . . for information on mechanizing your operation.

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- CONVEYORS
- ENGINEERED SYSTEMS
- FOUNDRY EQUIPMENT
- AUTOMATION
- STEEL FABRICATION

(Continued from page 172)

brass of the desired color can be used. If you have difficulty securing the color desired from the anodes, use strips of clean copper and zinc alternately, to obtain color desired.

A good plater can do wonders along this line. After the chasing is complete, the casting should be pickled carefully to remove oxides, dirt or grease which would play havoc when the patina is applied. Grease and oil are removed with alkalies. Three commonly used pickling solutions are listed in Table II.

TABLE II—PICKLING SOLUTIONS

Solution No. 1	
Sulphuric acid	1 part
Distilled water	100 parts
Solution No. 2	
Sulphuric acid	2 gal
Nitric acid	1½ gal
Salt	2 oz
Solution No. 3	
Sulphuric acid*	5 qt
Distilled water	5 qt
Nitric acid	4 qt
Muriatic acid	1 pt

*Add sulphuric acid to water gradually. After solution has cooled, add nitric and muriatic acids.

After pickling the casting, rinse it in a solution of 5 oz of cream of tartar and 1 gal of clean, hot water. Clean it in hot water and dry it with hardwood sawdust. The cream of tartar rinse will prevent any tarnishing prior to patina application. Be careful not to touch the face with your hands where it is to receive the patina. Hands will deposit salt, acid and oil from your skin and will spot the face. Drying the casting with hardwood sawdust prevents water spots.

Applying Patina—If left alone, metal in time will acquire its own color or patina. The coloring of metal with solutions and heat is largely a matter of experimentation and practice. Variables in metal composition and manner of application play an important role.

Work with a thin patina is in most instances much more expressive than that with a heavy or crusty patina. Heavy, crusty patinas should be used only on pieces designed expressly for that effect. The overapplication of patina causes a real loss in beauty and effect. Tin bronzes take a more nearly even patina than other types. Yellow brass is very difficult to patina because of the high zinc content. Table III lists a number of patina solutions by the colors they produce.

All these solutions can be either brushed on or applied by dipping. The temperatures of the solution and of the casting will have an effect on the patina produced. If pieces are to be matched, all of them should

be done in the same solution and at the same temperature. If this procedure is not possible, careful recording of the time, temperature, etc., used with one piece will be of great assistance in producing a duplicate patina on another. Most of the solutions are poisonous. Use rubber gloves.

TABLE III—PATINA SOLUTIONS

Green Patina*

Copper nitrate or copper sulphate	1 part
Water	10 parts

*Brush on hot bronze. Wash casting immediately. Repeated applications and washings will build up even color.

Brown-Black Patina*

Potassium sulphide or iron nitrate	1 part
Water	100 parts

*Apply as green patina solution.

Yellow-Green Patina*

Ammonium chloride	7 parts
Copper acetate	4 parts
Water	8 parts

*Parts are by weight. Apply as green solution.

Dark Blue-Green Patina*

Sodium thiosulphate	1 part
Iron nitrate	8 parts
Water	128 parts

*Apply as green solution.

Yellow-Brown Patina*

Caustic soda	5 parts
Copper carbonate	10 parts
Water	50 parts

*Parts by weight. Produces golden yellow to brown patina and usually is immersed in solution until desired color is reached.

Gray Patina

Arsenic chloride	1 oz
Water	1 pt

Blue-Violet Patina

Antimony chloride	1 oz
Hydrochloric acid	3 oz
Water	20 oz

Green Patina*

Crystallized iron chloride	3 oz
Ammonium chloride	16 oz
Verdigris	8 oz
Salt (NaCl)	10 oz
Potassium bitartrate	4 oz
Water	1 gal

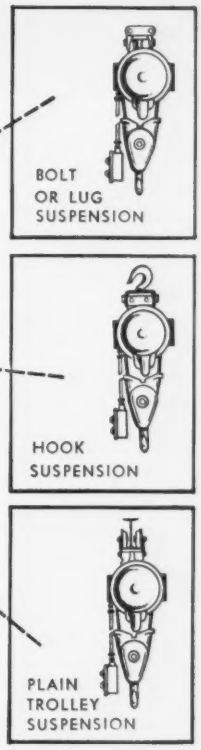
*Produces verde antique or rust green.

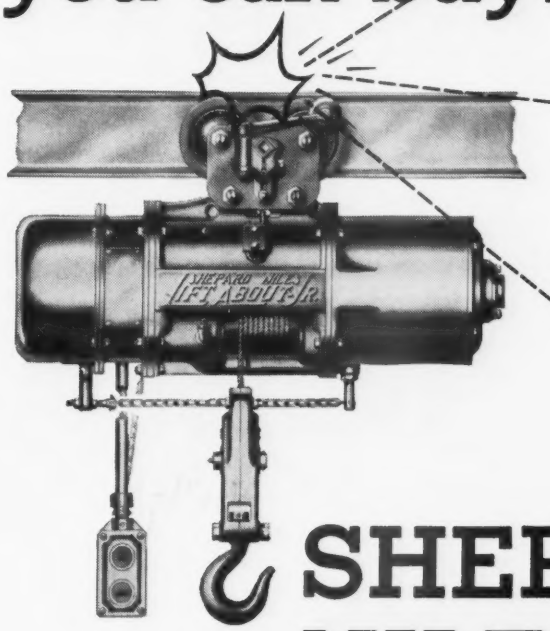
After applying the patina, washing the casting and drying it in hardwood sawdust, give the piece an even coat of colorless lacquer. The patina can be highlighted with a cloth buff or scratch brush, each producing a different effect.

Preventive Maintenance

Preventive maintenance, the discovery of and repair of defects in equipment before a breakdown, is explained in a new leaflet issued recently by the Small Business Administration, Lafayette Bldg., Washington. The importance, the theory and the advantages of preventive maintenance to small manufacturing plants is discussed in the leaflet, "Preventive Maintenance in the Small Plant," No. 38 in the agency's series of technical aids for small business. It can be obtained from any Small Business Administration field office.

TOUGHEST *Light-Service* HOIST you can buy!





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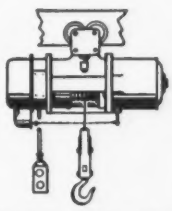
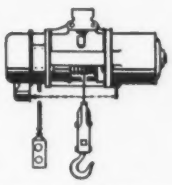
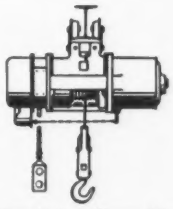


500 T Parallel or Cross Mounted.



1000 J Parallel or Cross Mounted.



2000 M Parallel or Cross Mounted.

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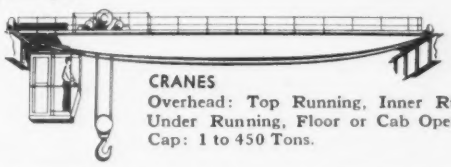
Let a Shepard Niles representative tell you about the complete Lift About-Jr. line. He'll help you select the hoist with the right capacity and controls for your job.



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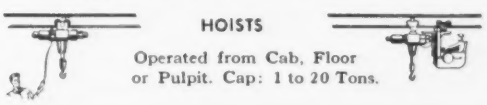

HOISTS
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FOUNDRY DEVELOPMENTS

By EDWIN BREMER

Metallurgical Editor

RADICALLY new and flexible ceramic coatings which are claimed to have wide application, have been developed at Armour Research Foundation, Illinois Institute of Technology, Chicago. Applied from chemical solutions, the coatings contain no adhesive or binding agent, are not brittle, and can be applied to almost any clean solid surface at a few hundred degrees F. Thickness of coatings is said to be controlled accurately, and while coatings as thick as 0.01-in. have been deposited, some only a few millionths of an inch thick have been made. Coatings are highly resistant to heat, and the more refractory ones can be used to protect a metal, for example, against molten metal or slag. Foundry applications include coatings for molds, cores, chills, inserts, stoppers, runners, crucibles, ladles, etc.

* * *

WHERE a variety of core mixes are in use no difficulty will be encountered in misapplication if the sands are dyed with specific colors. For that purpose a line of special dyes in a range of colors is available.

* * *

RESEARCH report entitled "Booth Ventilation for Swing Frame Grinders" by W. D. Bamford, and published in the June issue of the *Journal of Research and Development* (Birmingham, England), describes an investigation into the manner in which swing-frame grinding wheels carry dust toward the operator's breathing zone. From the information obtained a design for a ventilated booth was developed to keep the dust away from the operator.

* * *

FIRST practical x-ray microscope that can be produced in quantity was described at the meeting of the International Council of Scientific Unions held recently in London. According to General Electric, the x-ray source of the unit is 0.00001-in. in diam as compared to ⅛-in. in smallest conventional unit. Electrons are focused through two electrostatic lens, providing an image visible to the eye. Applications include alloy development, corrosion, welding, etc.

* * *

ALUMINUM Association, New York, has developed a new system of alloy designations for wrought aluminum and aluminum alloys which will go into effect in October, and may be of interest to some foundries. Briefly it consists of four-digit numbers of which the first indicates the general group and the last two identify the alloy or indicate the aluminum purity. Second digit indicates any modifications of the original alloy or impurity limits. Details of the system with tables showing the conversions from old to new designations and from new to old are contained in a booklet entitled "Alloy Designation System for Wrought Aluminum."

* * *

INVESTIGATION on "Grain Refining Additions for Cast Copper Alloys" by A. Cibula, and described in the July issue of the *Journal* of the Institute of Metals (Great Britain), indicates that marked grain-refinement is produced in bronze and gunmetal castings by additions of 0.03 per cent or more Zr, 0.2 per cent or more Ti, or 1.0 per cent or more Fe. Effect of Zr is almost independent of casting temperature up to at least 2156°F, and greatest when Sn or Sn plus Pb exceed 2 to 4 per cent and C or N is intimately in contact with the melt during or after deoxidation. Effect of Ti is influenced similarly by presence of C. In Fe-containing alloys greatest refinement occurs when primary Fe-rich dendrites are present. Additions of B (0.01-0.02 per cent by analysis) have little effect alone but increase refinement produced by Ti, Fe, Co and (to a smaller extent) Mn and Ni. Iron boride nuclei are effective only in alloys containing more than 5 to 7 per cent Sn or Sn plus Pb.

* * *

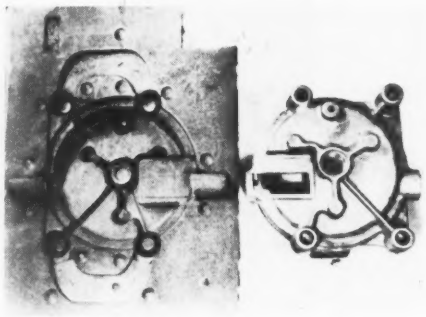
TECHNICAL information sheet available from Mallinckrodt Chemical Works, Second and Mallinckrodt Sts., St. Louis 7, describes a quantitative method for determining rare-earth residuals as low as 0.005 per cent in steels. Removal of major interfering components in a 1-gram sample of steel is accomplished by electrolytic separation with a mercury cathode. Rare earths in solution are precipitated with ammonium hydroxide with ferric iron as a carrier. Combined hydroxides are dissolved in a minimum of hydrochloric acid, adding uranium and sodium chloride as the internal standard and spectroscopic buffer. Rare earths then are determined spectroscopically, using a direct-current arc.

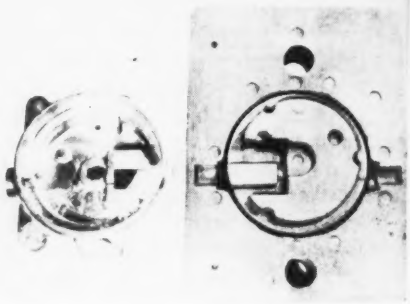
* * *

SULPHURIZATION or sulphur cementation of steel or cast iron to reduce friction in bearing applications is the subject of a report available from Library of Congress, Publication Board Project, Washington 25. Code number of the Report is PB 113742, and price is $1.50 for microfilm or photostats. Process consists of immersing steel or cast iron parts in a bath of suitable composition and temperature to make them highly resistant to friction or wear and tear, and can be used with hard and soft steels, stainless steel and castings. It is claimed that sulphurized steel bearings for rolling cylindrical shafts lasted approximately six times as long as bronze bearings of similar design.

* * *

REDUCTION of production costs by over 20 per cent for a new ice-crushing machine for counter use is said to have been accomplished through use of shell molding, according to Bakelite Co. Castings included the bowl, feeder guide, base, top plate, and gear case in aluminum alloy, and a worm gear in bronze. Illustration shows the intricate bowl for the machine with thin sections. Measuring 10½ x 10½ x 3½ in., the bowl now only needs drilling and tapping of ten small holes and reaming of three large bores as compared to previous machining operations of facing, boring, reaming, tapping and drilling. It is claimed that through use of shell molding, savings of $30 per machine were obtained.





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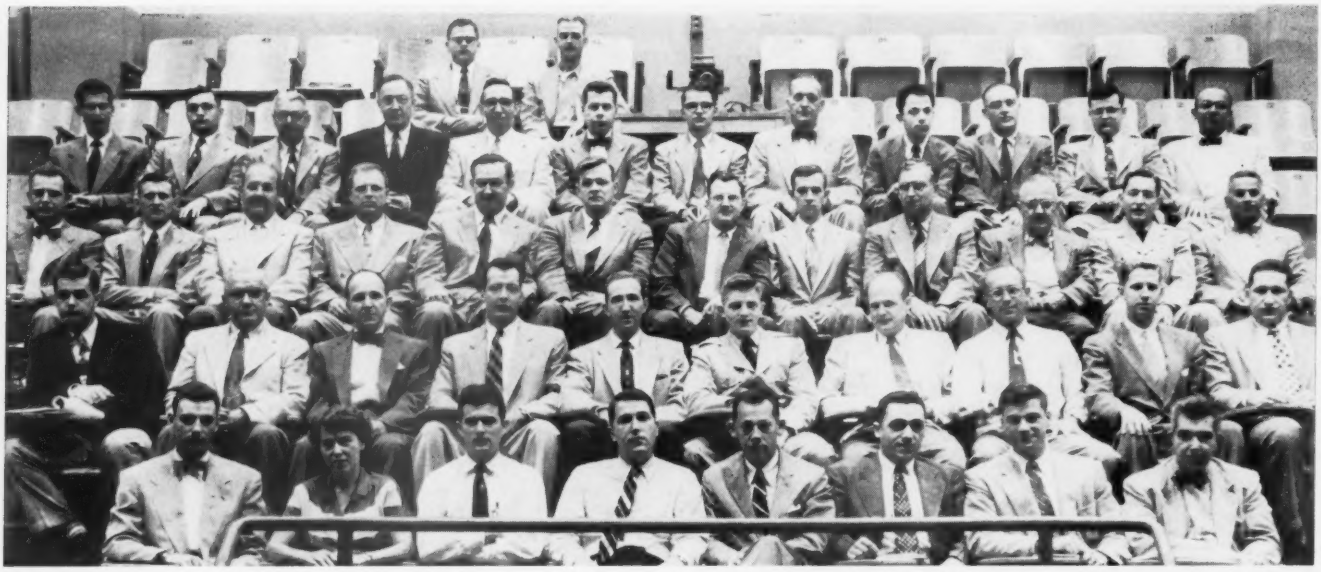
PROBLEMS IN CASTING LIGHT METALS

Discussed at Two-Week MIT Conference



Audience at one of the sessions held during the two-week conference at MIT on the casting of light metals

By GEORGE D. CHANDLEY
Massachusetts Institute of Technology

FOUNDRY Section of the Metals Processing Department at Massachusetts Institute of Technology held a two-week conference on the casting of light metals starting Aug. 23. The purposes of this program included:

1. To present the consumers' viewpoint of why light metal castings are used and why more castings are not used, 2. To describe and discuss the basic practices of sand, permanent mold and die casting, 3. To present special casting techniques that may be used where dimensional accuracy and thin sections are needed, 4. To discuss the principles of gating and risering that are so essential to the production of high quality light metal castings, 5. To present the fundamental theories of physical metallurgy that must be observed in the melting, casting and heat treatment of light metals in order to produce castings of uniformly high mechanical properties.

The wide scope of the sessions necessitated selecting speakers from all over the United States; they came from Massachusetts, Ohio, Pennsylvania, Michigan and California. The program attracted 75 attendants who represented states as far away as Florida, Alabama, Texas and California.

In addition to the lecture and discussion periods, there was a tour of the Institute and a dinner on Friday, Aug. 27.

C. C. Fawcett, director of research at Frankford Arsenal, officially opened the conference. He explained that the Ordnance Corps, through Frankford Arsenal, obtained much benefit from sponsorship of research on light alloys carried on by MIT, Battelle Memorial Institute and other research organizations. These benefits include the direct experimental results, theses written by students, and the subsequent training of personnel for industry. The results of this research contribute to the enhancement of army mobility because of the reduced weight made possible by the use of light metals. One thing which Mr. Fawcett stressed was that the principal battleground of the cold war is science and that, for this reason, the Ordnance Corps must sponsor research and utilize its results.

Consumers' Appraisal—Prof. Paul Sandorff of the Dept. of Aeronautics at MIT presented the results of a survey conducted among eighteen companies using airframes. These designers gave the following reasons for not using more than $10 million worth of castings for airframes each year:

1. Low mechanical properties.
2. Design safety factors for castings are high.
3. Poor quality.
4. Unsatisfactory tolerances.
5. Difficulty in obtaining thin sections.
6. Inadequate inspection and control methods.
7. Low elongation, warpage, and lack of reliability.

These designers stated that an increase in use of castings of 10 to 100 per cent would immediately be realized if variability in casting quality was decreased.

Prof. Sandorff used AZ92 to illustrate the variability properties that are undesirable. Test bars from AZ92 castings showed a distribution of tensile properties which indicated that one out of one-hundred test bars would fail at a stress of 16,000 to 18,000 psi. Using the maximum design stress of 17,000 psi would cause some parts to fail. Consequently, a designer feels that it is necessary to inspect all castings carefully. On the other hand, test bars from wrought aluminum are almost uniform and designers have a great deal of confidence in using wrought products; this confidence is evident since only minor inspection of wrought products is required by the designer.

Prof. Sandorff concluded that this variability in mechanical properties causes a prejudice against castings and that this prejudice will remain until the variabilities are reduced.

Andrew Slachta, Curtiss-Wright Aircraft Co., stated that his company uses light metal castings as engine components wherever possible, but that light metal castings have an

(*Continued on page* 180)

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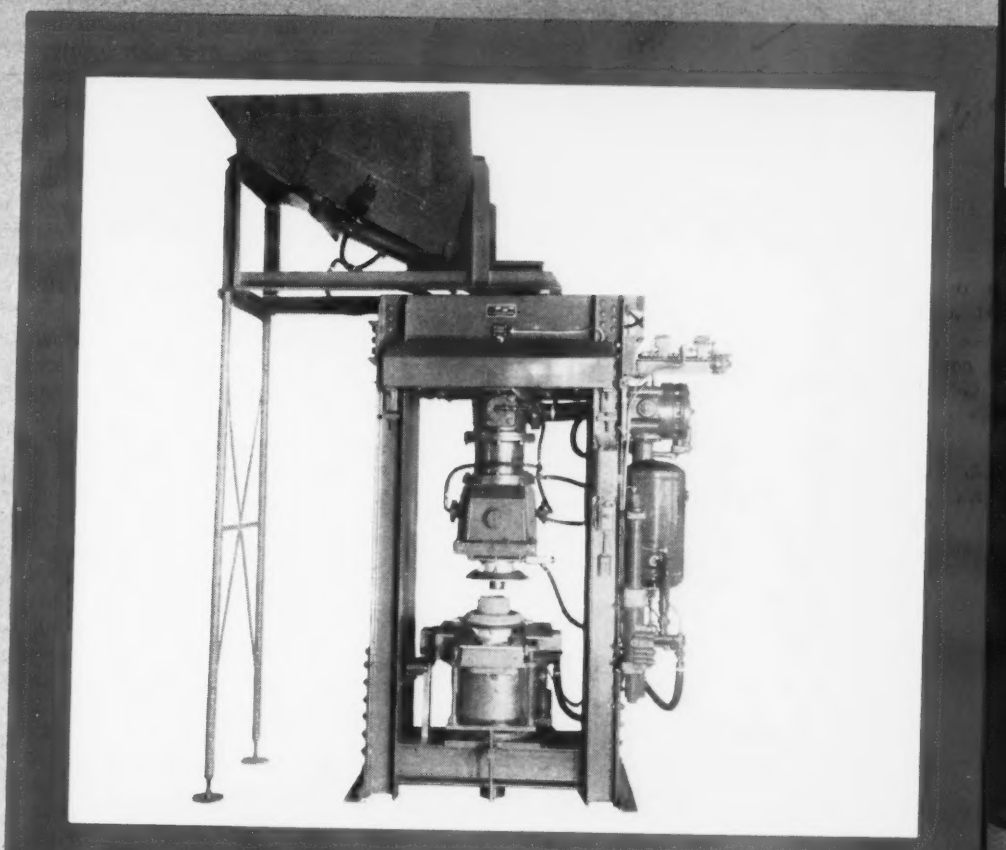
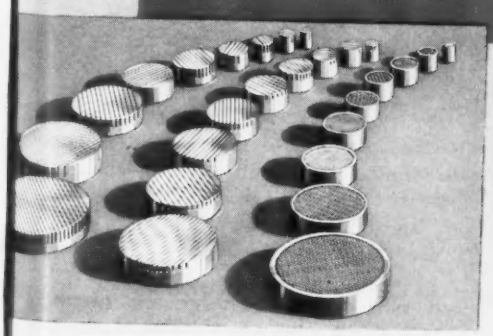
Core Blowers hold the record for BOTH:

1. Highest Production

2. Lowest Maintenance





Demmler is the best source, too, for precision core box vents. Brass slotted, steel slotted and screen types for every application, including the new D-process.

For core blowers, remember this: You cannot buy faster production, lower maintenance than Demmler's. The reasons are 1. Demmler-simplified design with all parts easily accessible, and 2. More rugged Demmler construction. The Demmler 100 Series is typical. On a defense project, these machines blew 2,000 cores per hour! And, many case histories show that they require only a fraction of the usual maintenance. The Model 103 shown above has electric-motor-driven mechanical sand agitator. And, it will blow ANY core or molding sand required in the foundry!

Write for literat

(*Continued from page* 178)
unfavorable strength-to-weight ratio above 400° F. Therefore, they have limited use near engines.

Cast parts are given static and dynamic service tests before they go into production. After the casting design is proof tested, it is given to an approved foundry for production. Mr. Slachta stated that knowing a foundry's procedure and record of quality casting is the best insurance of obtaining serviceable castings. Radiography and other means of inspection are used on all castings, but minimum variability is insured by purchasing only from foundries that are approved.

The requirements for aircraft engine components are rigid and definite; if the consumers did not demand high performance from the foundries, the variability in mechanical properties would be so large that castings could not be used.

C. M. Adams Sr., Bohn Aluminum & Brass Corp. and recently director, Aluminum-Magnesium Div., BDSA, Washington, outlined briefly the government's interest in light metal castings. The government is well aware of the strategic importance of light metals and for that reason is stockpiling aluminum and titanium. Aluminum mining in the United States, although more expensive than in foreign sources, is being encouraged with financial aid from the government. This is done so that the U. S. will have a supply in the event that foreign sources may be cut off in time of emergency.

Casting Practices—Paul Frost of Battelle Memorial Institute described present casting practices for aluminum. Mr. Frost chose alloy 220 as an example of a difficult alloy to cast and presented some of Battelle's research results. The primary difficulties in casting alloy 220 are due to gas porosity, dross inclusions and shrinkage; this is true to a lesser extent for all aluminum casting alloys. Gas porosity is controllable only by degassing the metal before pouring; the hydrogen content can be reliably checked with a reduced pressure tester. Dross inclusions can be eliminated by following the gating practice outlined in research done at Battelle for the American Foundrymen's Society. Shrinkage can be eliminated by proper combinations of chills and risers, but usually in castings of alloys like 195, 220 and 356 there is some microporosity.

Herbert E. Elliott, Dow Chemical Co., touched on almost every aspect of magnesium sand casting practice. Eighty per cent of the magnesium castings made today are done in magnesium-aluminum-zinc alloys and most of the castings are for aircraft.

Only a few of Mr. Elliott's important points can be given. Urea-formaldehyde is the most satisfactory core binder for magnesium casting because it can be readily cured in dielectric ovens and the binder decomposes rapidly during casting, thus reducing the possibility of hot tearing. Action of inhibitors in magnesium molding sand is to form an impervious film on the casting that prohibits further mold reaction. Diethylene glycol is used up to 2 per cent in molding sand; it keeps the sand moist even when it is hot. Castings must be gated at the lowest point in the mold and many ingates must be used to expedite filling of the mold. Many chills are used in magnesium founding to obtain high mechanical properties.

In general, about 6 pounds of magnesium must be melted for every pound of shipped castings. This is due to the use of large and numerous risers and gates; also, there is a rejection rate of 15 to 20 per cent.

D. L. Colwell, Apex Smelting Co., described the processes of making in-

(*Concluded on page* 183)

Modernize your cleaning room with Standard's cost cutting, high production snagging grinders

This single wheel infinitely variable speed grinder maintains 9500 S.F.P.M. all the way down to the flanges. By turning hand wheel, guard is adjusted and spindle speed is increased simultaneously in relation to worn wheel. No tools are needed for adjustment.

Available in single and twin wheel construction. 5 HP to 100 HP. 18″ to 30″ wheels.

Write for catalog and complete details.

FOUNDRY GRINDER DIVISION

the STANDARD electrical tool co.

MACHINE TOOLS

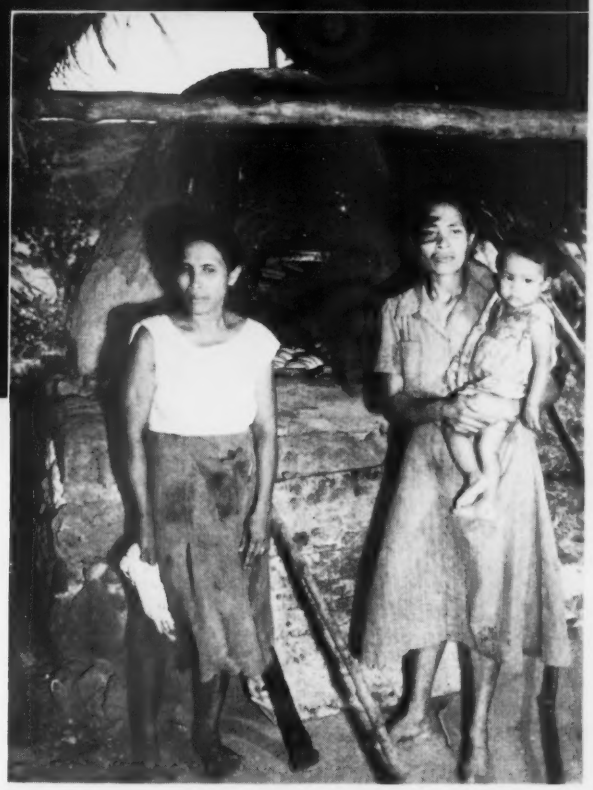
2507 RIVER ROAD • CINCINNATI 4, • OHIO

SEE US IN BOOTH 1028,

METAL SHOW, CHICAGO, NOV. 1-5

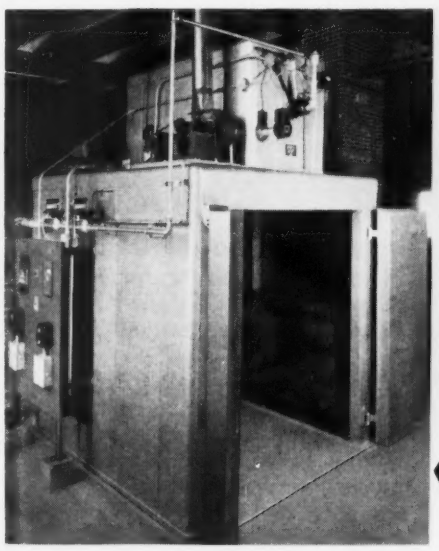
This **OLD MUD OVEN** still bakes ...but how efficiently?

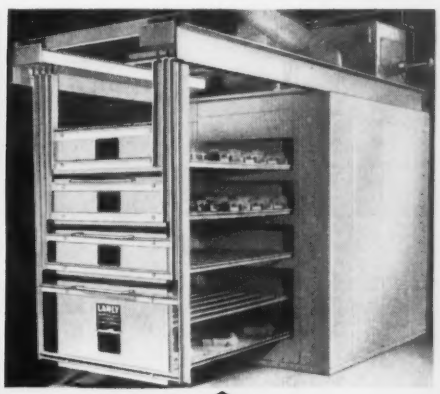
Despite the availability of modern kitchen stoves and ovens, travelers can still view the almost pathetic baking operations of old mud ovens.



...even **TODAY,** many Foundries are operating out-dated obsolete core ovens

Outdated, inefficient foundry ovens can drag on production and profit figures in much the same way as old mud ovens hamper volume output and quality on the bread producing line.





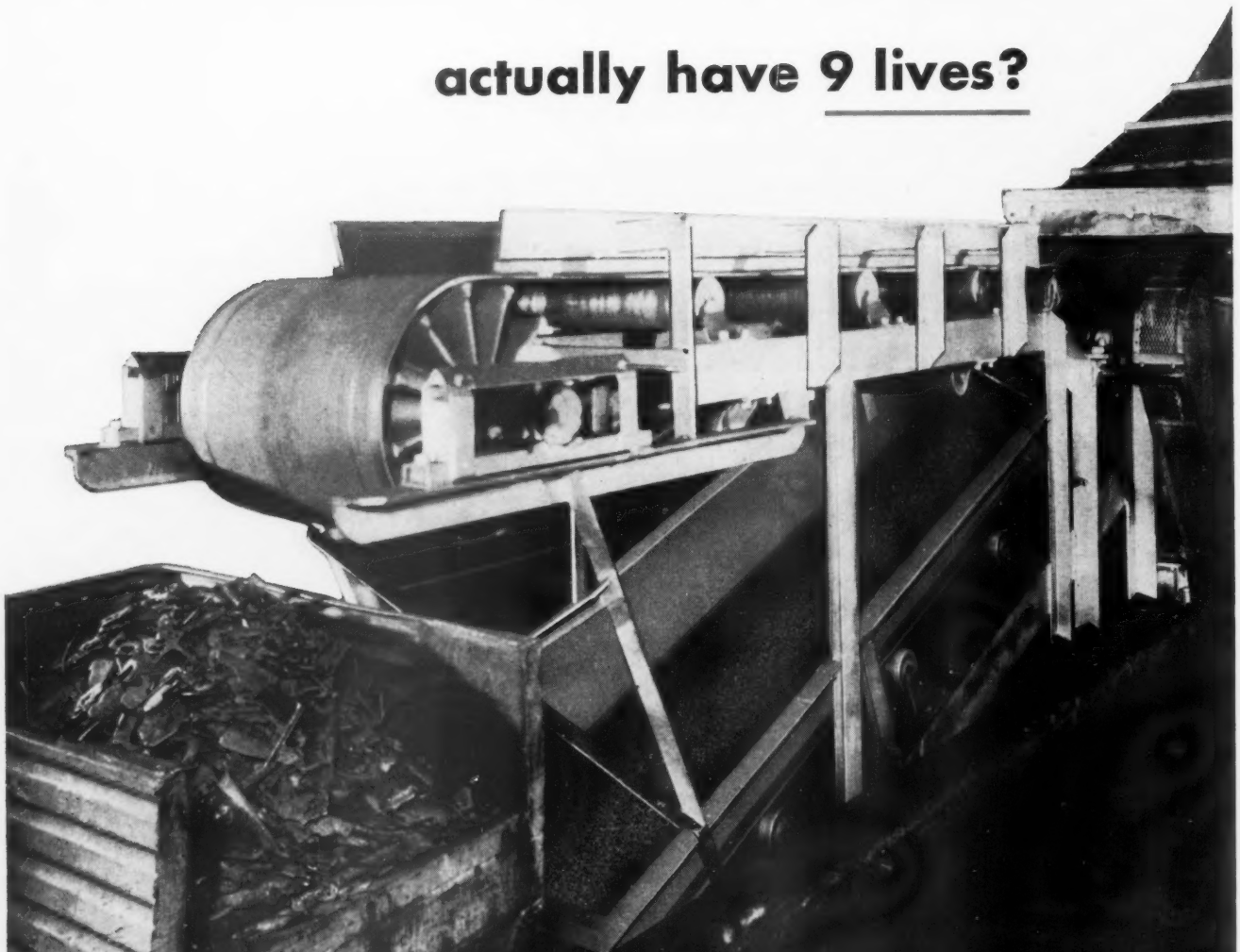
1. Drawer Type Oven
2. Single Compartment Rack Type Oven
3. Car Type Oven

Isn't this an opportune time to examine closely the oven facilities of your foundry for a possible improvement? The average foundry requirements can be met with standard LANLY units. Custom designed units for core baking, pasting and mold drying are part of LANLY'S services, as well as ovens for casting conditioning and heat treating.

WRITE FOR THE LATEST CATALOG AND FACTS ON ANY INSTALLATION

LANLY
FOUNDRY OVENS
THE LANLY COMPANY • 780 PROSPECT AVE
CLEVELAND, OHIO

Does this Resistorip shake-out belt actually have 9 lives?



Already this 30″ wide, 220 ft. long *Resistorip* belt has lasted *7 times* as long as the best previous belt of conventional construction on this shake-out conveyor. And it's still going strong in one of the country's largest grey iron foundries.

The secret of this belt's money-saving resistance to ripping and slitting is its unique patented construction. At close intervals throughout its length, groups of high-tensile steel wires are built into the carcass at right angles to its direction of travel. When a sharp, jagged metal flashing starts to rip the belt, it quickly encounters one of these transverse wire groups. Immediately it is kicked out . . . and damage to the belt is restricted to a small section, only inches in length!

If you are now replacing shake-out belts every 4 or 5 months, or less, think what you'd save with a belt that lasts for *years!* Call your NYB&P Distributor today. He can provide you Resistorip belting with any required thickness of heat-resisting rubber cover. For his name and address phone PRescott 7-6940, Passaic, N. J., or write to address below.

NYB&P

NEW YORK BELTING & PACKING CO. Founded 1846

NEW YORK BELTING & PACKING CO. 1 Market St., Passaic, N. J.

America's Oldest Manufacturer of Industrial Rubber Products

(*Concluded from page* 180)

gots for foundry use and casting in permanent molds. Many of the difficulties that may be encountered in production should have been eliminated in the original design of the casting. Some of these are: Undercuts in mold cavities; lack of adequate filleting; use of thick sections rather than thin sections with rib reinforcement; use of no, or too little, taper on sections to be drawn, and specification of small tolerances which are not necessary.

Directional solidification under high thermal gradients, with its accompanying high mechanical properties, may easily be obtained in permanent mold casting. This is usually done by proper gating and risering in conjunction with copper chills and mold wall insulators such as washes and asbestos.

The mold cavity must be vented either by riser, drilled vent, or parting line. Otherwise air entrapment will occur and the casting will be defective.

Mr. Colwell then gave a detailed description of foundry practice and production. The main concern in production is to operate the mold at a constant temperature, which is usually around 700° F. Control is achieved by setting up a standard time cycle for producing a given casting.

Gaining Wider Acceptance

In conclusion, Mr. Colwell said that the permanent mold process is tremendously popular and gaining wider acceptance. In many instances permanent mold castings can compete with forgings and the goal toward which permanent mold foundries should work is to achieve properties as high as forgings of similar composition.

Henry Van Dyke, Doehler-Jarvis Co., described many of the new developments in pressure die casting. There is a strong trend for magnesium to replace aluminum, partly because of its low volume heat of fusion. This characteristic is important because magnesium does not subject the dies to a great heat shock and production rates are faster. Soundness and surface of magnesium die castings are excellent and cored holes require less taper than aluminum. A wide variety of portable machines have many components that are die cast in magnesium.

At present, machines that will accommodate a 6-foot die are being developed, and there seems to be no upper limit to the size and complexity of castings to be made by the pressure die process.

Special Casting Processes—Robert Alfred, Rode Inc., discussed precision investment casting of light metals. Two major difficulties are lack of permeability of the investment and hydrogen in the aluminum. Usually, molds are filled by centrifuge or by pulling the metal into the mold with a vacuum. The molds are preheated almost to the pouring temperature of the metal; this causes very slow solidification which, in turn, allows the dissolved hydrogen to segregate and form large holes in the casting. Consequently, the metal must be thoroughly degassed before pouring.

Mr. Alfred concluded that the three most important factors in precision casting are: 1. Care, 2. Cleanliness, 3. Close control. Precision founders sell low tolerance and fine surface finish castings so careless work cannot be tolerated.

L. C. Turner, Morris Bean & Co., gave a detailed description of the Antioch process for making light metal castings in plaster molds. The normal objection to gypsum as a mold material is that it has low permeability and low thermal conductivity. In the Antioch process the gypsum mold is rehydrated and then dried to give excellent permeability. Up to 50 per cent sand is added to the slurry mix to increase the heat capacity of the mold.

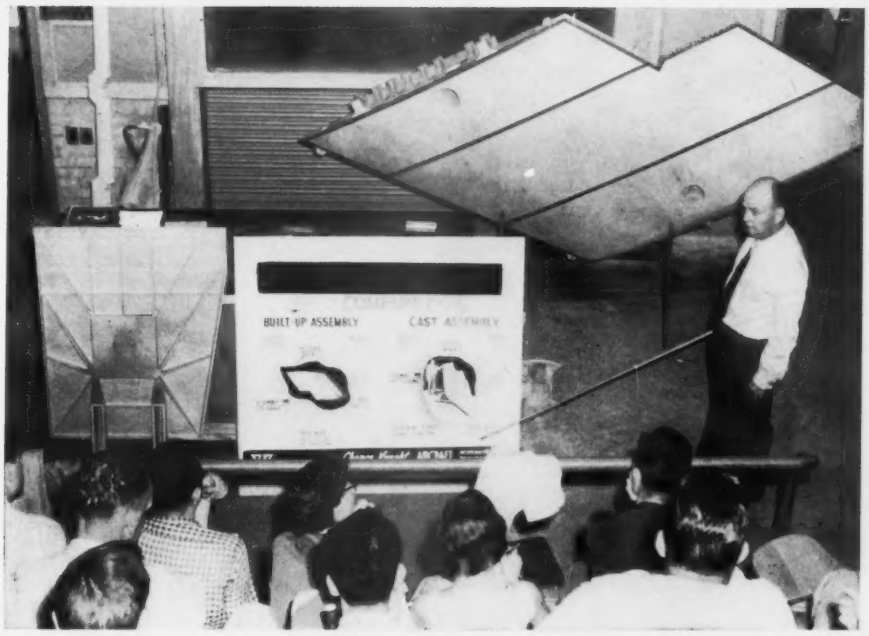
The slurry mix sets up in about six minutes and has a green strength of 70 psi; this strength makes it possible to use flexible patterns with odd shapes. Also, the green strength of the mold enables the molder to place chills at will on the pattern; these chills will not move during subsequent handling and are widely used in the Antioch process. The molds undergo almost no change in dimension in the process.

Mr. Turner emphasized metallurgical quality in the Antioch process; in many cases a guarantee of 100 per cent of specified properties in certain sections of the castings is given. These properties are obtained by the use of chills, even in castings which range in size up to 1000 pounds.

R. H. Osbrink, R. H. Osbrink Mfg. Co., described the foundry procedure which has enabled him to produce thin-walled castings which for years have seemed out of the realm of sand casting. These castings have replaced many fabricated parts.

Meticulous attention to detail is the secret to the success of the Osbrink foundry. Patterns and flasks are precision tools; cores are indexed with gages; molding is done by hand; pouring temperature is carefully controlled in order to produce good surface; the pouring procedure used for complex castings is practiced before the metal is actually poured.

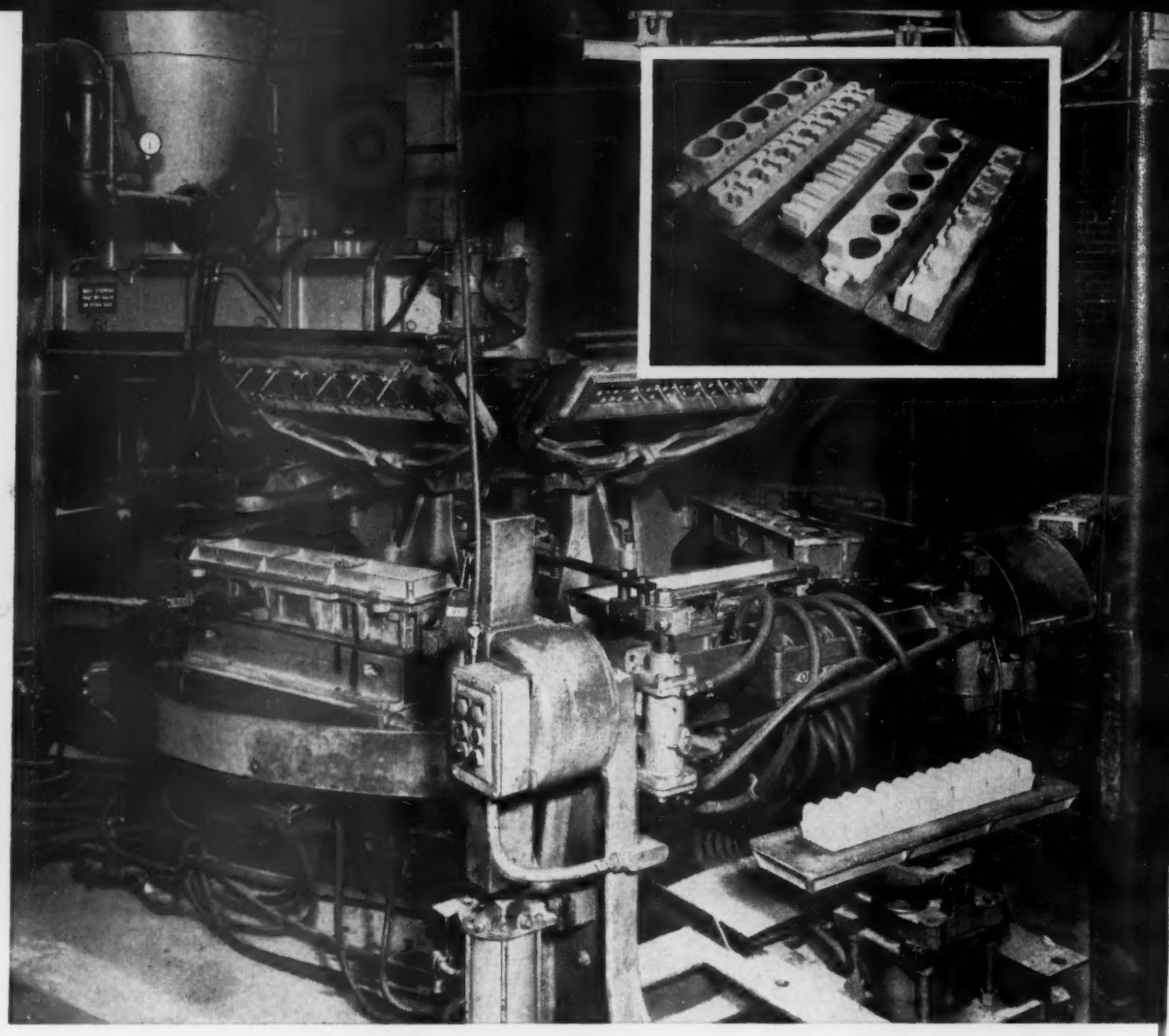
(*To be concluded next month*)



R. H. Osbrink, Los Angeles, illustrating one of the many thin-wall castings made by R. H. Osbrink Mfg. Co. (Photos by George Schmidt)

Book Describes History Of English Foundry

A story of centuries of iron making on one site is told in "The Coneygre Story," recently published by Coneygre Foundry Ltd., Tipton, Staffordshire, England. First iron was made in a blast furnace and by 1834 foundry production had started. Illustrations show Coneygre as it was over 100 years ago and as it appears today. Present facilities also are described.



Fast, efficient production of automotive cores in sets attained with the Roto-Core Automatic. Roto-Core can make as many as 5 different cores at one time or 5 duplicate cores simultaneously at a rate of over 300 blown core boxes per hour consistently.

One of these OSBORN Core Blowers can cut your costs

...HAVE AN OSBORN REPRESENTATIVE SHOW YOU HOW

What's your core production . . . great quantities . . . smaller jobbing runs? With the proper core blowing machine from Osborn's complete line, you can make *more* cores, better cores and for less money. Here's why:

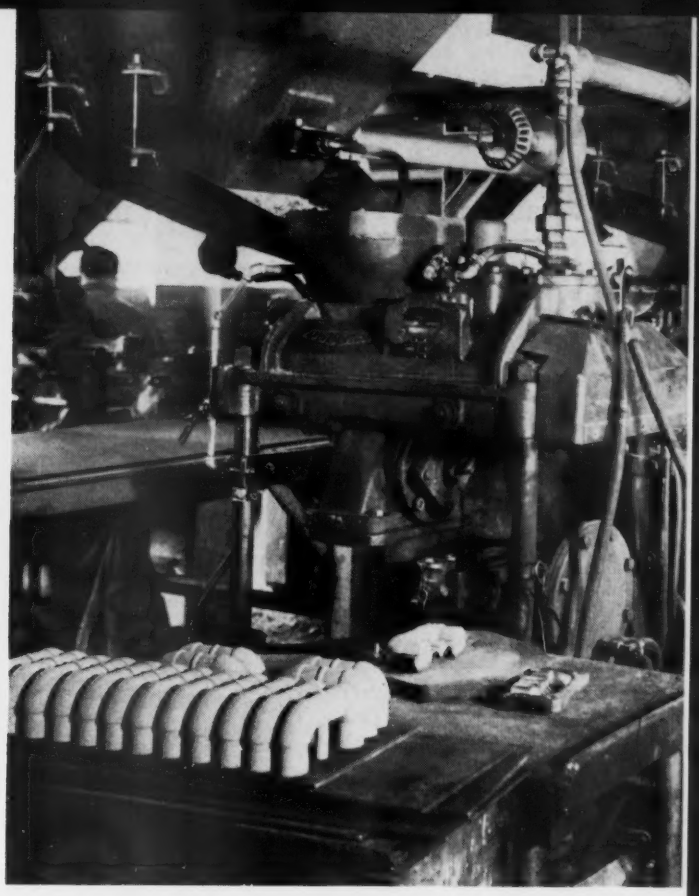
There's a right size and type of machine for every core blowing need. Fast operating, Osborn machines make more use of foundry manhours, require less effort and training to operate. As a result, core production is more efficient, greater per manhour and remarkably consistent throughout the day.

Your Osborn representative is a factory-trained foundry specialist. Have him look over your work. From experience, he can show you how to save on many types of jobs. Write or call.

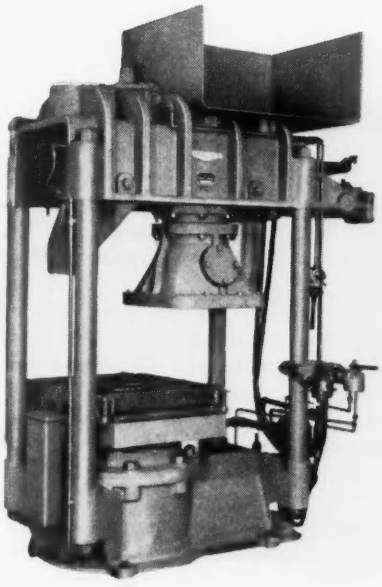
THE OSBORN MANUFACTURING COMPANY
5401 Hamilton Avenue *Cleveland 14, Ohio*

OSBORN . . . THE COMPLETE LINE OF MOLDING MACHINES AND CORE BLOWERS

Osborn Draw-Type Core Blower equipped with automatic control, core box locater and rollers on the table producing deep barrel cores on pre-set time cycle.

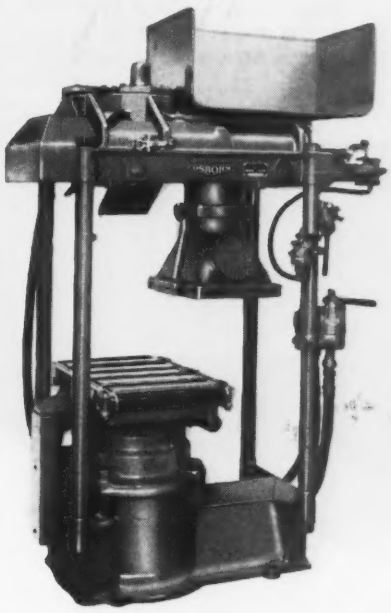


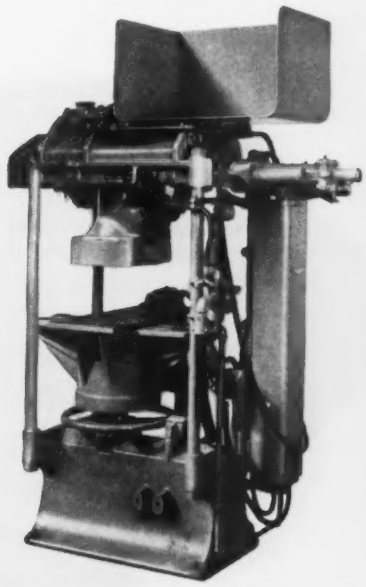
Osborn Diaphragm-Type Core Blower with automatic controls, horizontal clamps and core box ejector producing pipe fitting cores every 6 seconds using vertical split core box.



For Large and Heavy Cores, Osborn Model 194 meets the demand for big cores and core boxes requiring extremely high clamping pressures or cores of unusual length and width.

For Medium Cores, Osborn Model 193 efficiently produces cores for the vast assortment of high production and jobbing cores that fall within the medium size range.





For Small Cores, Osborn Model 191 is intended for fast, economical production of small cores for valves, fittings, plumbing specialties and similar jobs.

Another example of
Osborn leadership
and advanced engineering

OSBORN

MOLDING MACHINES CORE BLOWERS

INDUSTRY BRIEFS

AMERICAN Steel Foundries plans to cease operations at its plant in Newark, N. J. An attempt will be made to dispose of the property as an operating foundry, but the plant, currently employing 240, will be closed down as of Oct. 31 if a satisfactory purchaser is not found. The company will continue to operate 19 plants with a total employment of 7500.

* * *

Cooper Alloy Foundry Co., Hillside, N. J., has changed its name to Cooper Alloy Corp. Continued extension of facilities and services made it advisable to change the name and to provide individual identity for the following divisions: Foundry Products Division, Valve and Fitting Division, Aircraft Products Division, and Stainless Engineering & Machine Works Division.

* * *

Frederic B. Stevens Inc., Detroit 16, is now distributing in northern and northeastern United States a new bead-type compound for cope and drag sealing. Known as Kopeseal, it is a product of Presstite Engineering Co., St. Louis 10.

* * *

Metallizing Engineering Co. Inc., has moved its eastern offices, factory and warehouse to 1101 Prospect Ave., Westbury, Long Island, N. Y. The previous location was 38-14 30th St., Long Island City, New York.

* * *

Allis-Chalmers Mfg. Co., Milwaukee, has appointed two new distributors to handle products of its general machinery division. The McJunkin Corp., 1352 Hansford St., Marietta, O. will distribute motors, controls, pumps and V-belt equipment in several counties in Ohio and West Virginia. The J. H. Nicholson Supply Co., 2026 St. Mary's Ave., Omaha, Neb., will distribute general purpose motors in eastern Nebraska and part of Iowa.

* * *

Elwell-Parker Electric Co., 4205 St. Clair Ave., Cleveland 3, has appointed the Frank L. Colker Co., Book Bldg., Detroit, its Michigan sales representative for its line of power industrial trucks. Frank Colker has taken over the personnel and offices formerly headed by Frank E. Price, who died recently.

* * *

Mercast Corp., 295 Madison Ave., New York 17, and Guest, Keen and Nettlefolds Ltd., London, England, have jointly formed a British company, Mercast (Great Britain) Ltd., to license the use of the Mercast process to firms in the United Kingdom and the British Commonwealth (excluding Canada).

* * *

Curtis Mfg. Co., St. Louis, is celebrating its 100th anniversary. The company's products which are marketed on a world-wide basis include pneumatic machinery, refrigeration units, saws and clutches.

* * *

Steel City Testing Machines Inc., Detroit, maker of equipment for testing physical properties of metals, has appointed two new sales representatives: Dabar Industrial Sales Co., 5878 Delmar, St. Louis 12, and Precision Tool Service Co., 5891 West 76th St., Los Angeles 45.

* * *

Salem-Brosius Inc. and Phillips Corp., both of Carnegie, Pa., have agreed to pool production facilities. Salem-Brosius, manufacturer of heating and heat-treating furnaces and special machinery, and Phillips, producer of materials handling equipment, mine and mill supplies, will maintain their separate corporate identities. Salem-Brosius will handle Phillips production work on a contract basis, using its present facilities plus equipment from Phillips.

* * *

Edwin L. Wiegand Co., 7500 Thomas Blvd., Pittsburgh 8, has announced the formation of Couchman-Conant Inc., Indianapolis, who will represent them in the sale of electric heating units. Alan Conant joined the John T. Couchman Co. to form the new organization, Couchman-Conant Inc.

* * *

Ironton Fire Brick Co., Ironton, O., has appointed Foundry Service Co., 2321-29th Avenue North, Birmingham, its representative for accounts in Alabama, Georgia and South Carolina. A complete warehouse stock of refractories will be maintained in Birmingham for prompt shipments.

* * *

Bentonville Casting Co. Inc., Bentonville, Ark., has recently been granted a charter of incorporation. The incorporators are Wayne W. Carlson and H. T. Hendricks of Bentonville, Robert M. Nelson and Edwin F. Coombs of Memphis, Tenn.

* * *

Acheson Colloids Co., Port Huron, Mich., has opened a sales office serving Texas, Arkansas, Oklahoma and Louisiana. Clifford T. Olsen, service engineer, will manage the new office located in the Suburban Bldg., 5526 Dyer St., Dallas 6, Tex.

* * *

Institutum Divi Thomae, Cincinnati, has purchased the major portion of stock in the Wilmington Casting Co., Wilmington, O.

* * *

Western Foundry, 2000 East 40th Ave., Denver, suffered fire damage estimated at $40,000 on Sept. 2.

* * *

Republic Steel Corp., Pressed Steel Division, Cleveland, has appointed two distributors to handle the sale and distribution of their materials

(*Concluded on page* 188)

CELEBRATES ANNIVERSARY: Stanley G. Flagg & Co., Philadelphia, manufacturers of malleable iron, cast iron and bronze pipe fittings, is celebrating its 100th anniversary this year. The company held an open house at its Stowe, Montgomery County, Pa., plant for employees, their families and community guests. During the three-day celebration, 4100 persons were taken on conducted tours through the modern facilities

Here's modern press control at its ***SAFEST***

Yes, with the **Schrader Two-Hand Press Control** you'll find operator confidence soars—and so does production—because this easy-to-install unit can be operated only by both hands simultaneously. This means:

1 ***Production hits new highs*** **as operators, no longer worrying about personal safety, develop a new high-speed work rhythm in short order.**

2 ***Production stays high,*** **because the effortless fingertip operation with Schrader Controls leaves operators fresh and alert, even after a full day's work.**

Look over the mechanical-clutch machines in your shop. Wherever you find operators straining back and leg muscles to maintain production—tiring themselves so that they are less alert to safety precautions—*there's a real need for Schrader Pneumatic Controls.* Available for easy foot operation as well as two-hand operation as shown here, Schrader Control Sets come complete and ready for mounting on your presses.

Ask us to help you decide which of the several Schrader Control Sets will fit your needs best. Simply write us, outlining your installation—or fill out the coupon below.

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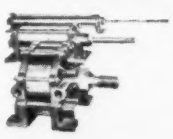
Leaders in air control since 1844



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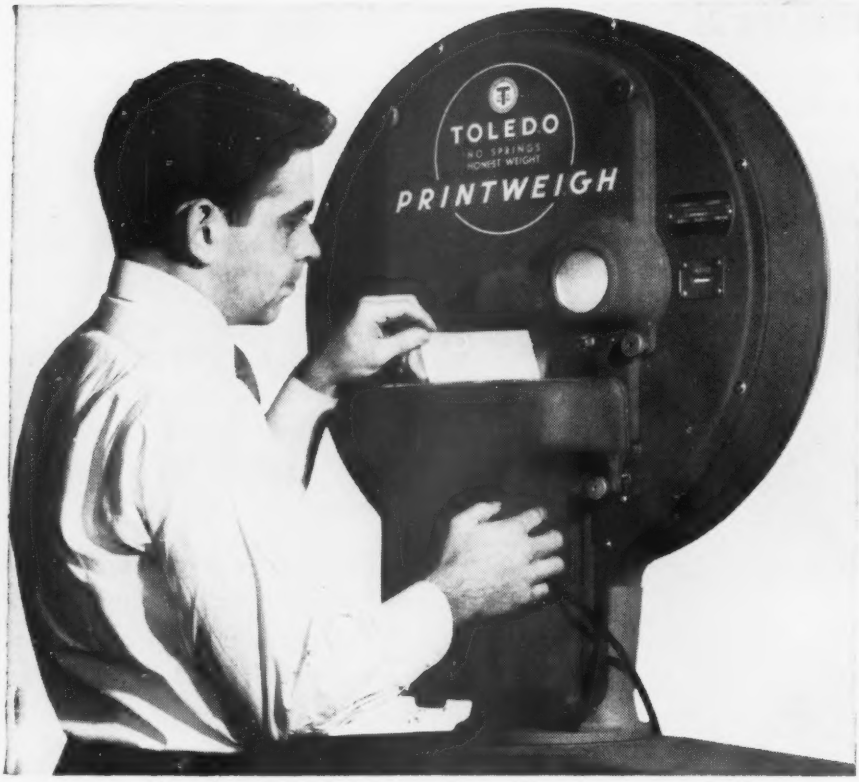
Division of Scovill Manufacturing Company, Incorporated
465 Vanderbilt Avenue, Brooklyn 33, N. Y., Dept. M-1.

I am interested in more information on _____

Name_____ Title_____

Company_____

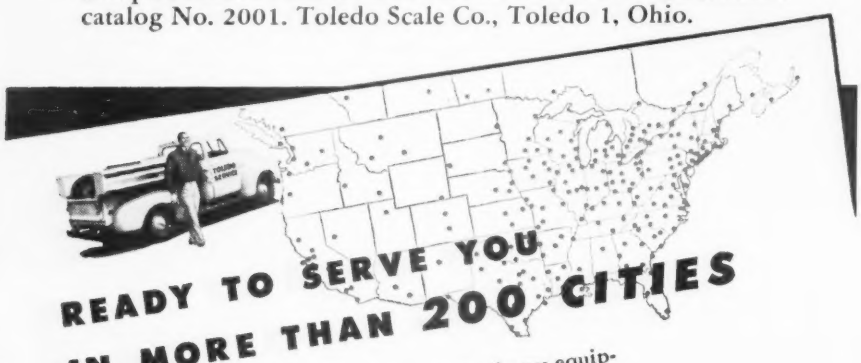
Address_____



Control Today's Costs PRINT the Weight!

New Toledo Printweigh Scales meet your needs today for *closer cost control!* Stop human errors in reading, remembering, recording . . . provide accurately printed weights with split-second speed . . . accurately recorded!

Printweighs are available for dial type scales in the great new line of Industrial Toledos! *44 new features* include . . . new clean-line design . . . double-pendulum mechanism in one-piece sector . . . lifetime fulcrum. Send for new condensed catalog No. 2001. Toledo Scale Co., Toledo 1, Ohio.



READY TO SERVE YOU IN MORE THAN 200 CITIES

For practical assistance in the selection of new equipment—for efficient installation—or for dependable, factory-trained service, look to your local Toledo office as headquarters. Phone there for emergency repairs on all makes of scales. Ask about the economy and assurance of Toledo service agreements for regular, periodic inspection—"the ounce of prevention" that guards essential equipment.

TOLEDO®
HEADQUARTERS FOR SCALES

(*Concluded from page* 186)

handling equipment. They are the Thompson & Johnson Equipment Co. Inc., Baker Street Industrial Park Area, P. O. Box 247, Eastwood Station, Syracuse 6, N. Y. and J. Alex Gordon & Co., 810 Stephenson Bldg., Detroit 2.

* * *

Harnischfeger Corp., Milwaukee, recently celebrated the building of its 15,000th heavy duty crane. The first of the company's heavy duty cranes was built in 1887. The 15,000th crane was installed in the pipe plant of A. O. Smith Co. in Houston, Tex.

Fairbanks-Morse Foundry

(*Continued from page* 111)

vices for automatic additions of bond and moisture, are located on the second floor of the coreroom and are fed from two 100-ton-capacity bins on the third floor.

The intermediate or No. 2 molding area is designed to provide uninterrupted operations even though only one or a few molds may be required from many of the patterns. This flexibility is accomplished by use of a rotating table and sandslinger in combination with a rollover, pattern draw machine. Flasks and patterns move over a roller conveyor to the table, and after being indexed through ramming and finishing stations, travel to the pattern draw machine. The pattern then may be returned for making additional molds or sidetracked over a roller conveyor to storage racks. Molds are lifted by crane to a power mold conveyor.

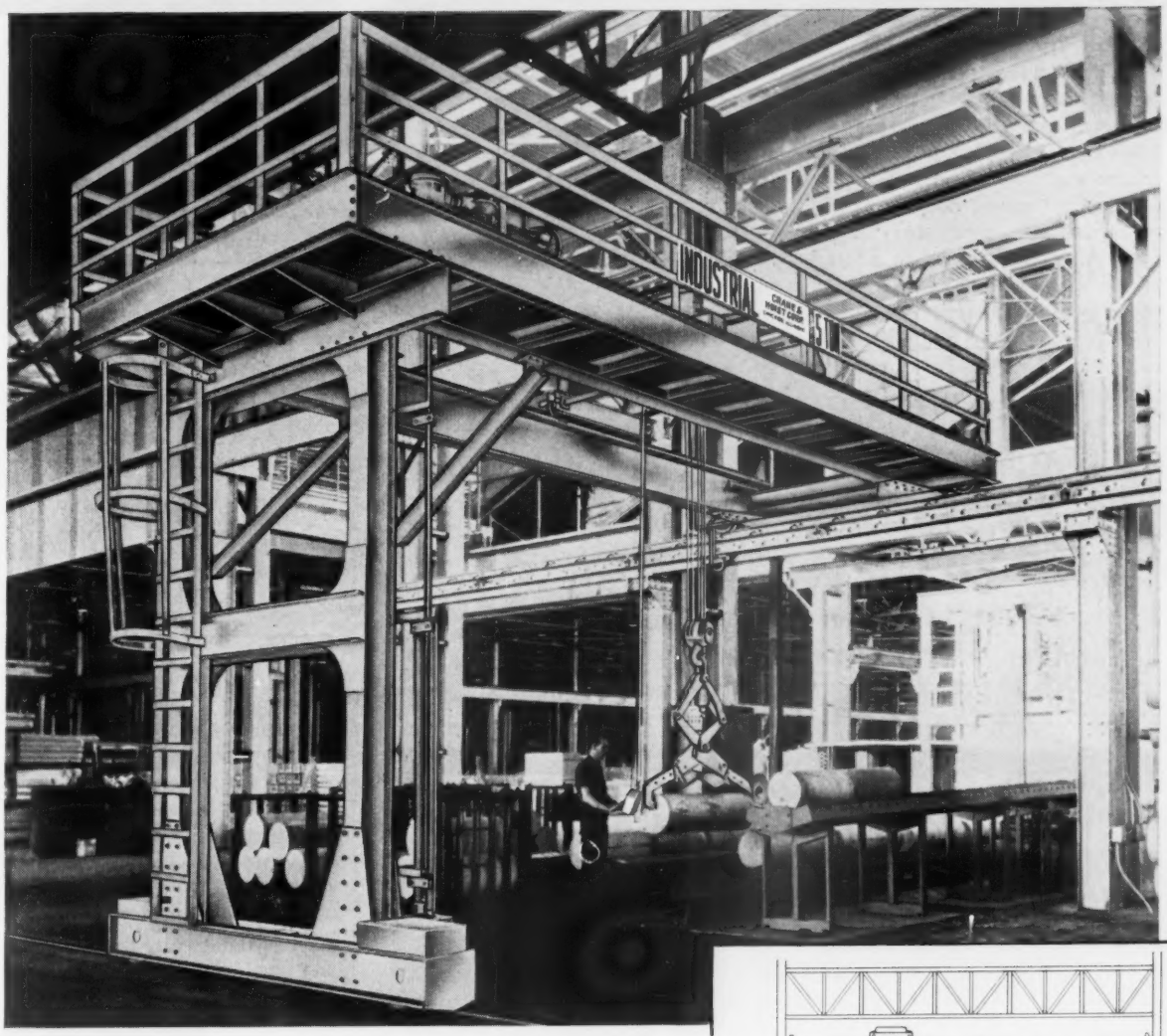
Pouring station for these molds parallels that for the No. 1 line. Hot metal for both lines is delivered over the same monorail.

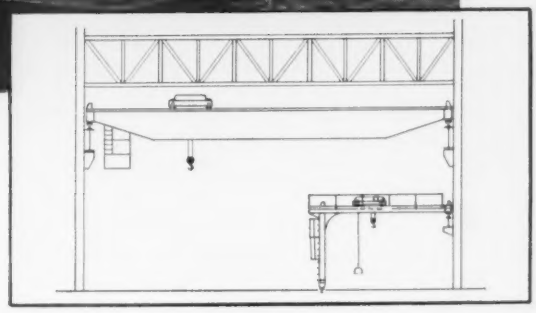
A unique arrangement is provided on the No. 2 line to eliminate smoke and fumes from poured molds until they are ready to be shaken out. It also saves considerable floor space. Replacing the usual type of tunnel is a basement room into which the conveyor train descends upon leaving the pouring station. There the conveyor describes a loop, and by the time it reappears at floor level where the cope shakeout is located, the molds have had an 80-minute cooling period. An exhaust system removes gases generated in the room.

Copes are lifted onto the shakeout by crane, and a pneumatic pushoff moves the drags from the conveyor at a second shakeout. Castings are hooked to the cooling conveyor or placed in trays, while flasks are re-

(*Continued on page* 190)

Industrial SEMI-GANTRYS SPEED BILLET HANDLING





The diagram illustrates the relative positions of the Industrial Semi-Gantry and the heavy capacity overhead crane, both of which operate without interfering with each other.

Industrial CRANES

An Industrial motorized Semi-Gantry does a production job handling billets from racks to a conveyor in a large metal plant.

Serving a local area in the factory the Industrial Semi-Gantry operates on its own runway—freeing the heavy capacity overhead crane for other important jobs, resulting in overall savings in operation and maintenance.

Consult with Industrial Crane & Hoist Corporation for an economical solution to your materials handling problems.

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341 NORTH ADA STREET **CHICAGO 7, ILLINOIS**

Overhead Cranes • Jib Cranes • Monorail Systems • Crane Runways

Representatives in Principal Cities

SG 1054 C

(*Continued from page* 188)
turned to the molding stations by roller conveyors. This is the same cooling conveyor that serves the No. 1 line.

The No. 3 heavy molding area has a floor capacity of about 55 molds. Flasks are rammed by a stationary sandslinger that is located alongside roller conveyor lines. Sand is provided by the department's individual system, which includes a muller with an hourly capacity of 25 tons of prepared sand and a 100-ton storage bin. The area has a 10-ton cab-operated crane and two 5-ton floor operated cranes. Cranes are used to draw patterns, set cores, close and set out the molds and pour, in addition to subsequent handling of castings during cleaning operations.

Casting Cleaning—The main cleaning room area, measuring 60 x 180 feet, processes the small and intermediate size castings. It is efficiently arranged for straight-line flow of castings from their unloading from the cooling conveyor at one end to spray painting at the other. The largest castings are cleaned in a section where extensions of the heavy molding and main cleaning areas intersect.

As the small castings arrive on the conveyor they are sprued and sorted into dump hoppers, then trucked to a nearby airless blast barrel. The latter unit has a cleaning capacity of 5 tons an hour. Cleaned castings are discharged into pans for delivery by roller conveyor to chippers and grinders. Castings of intermediate size first are placed on a vibrating knockout to remove cores. Next they are hung on hooks of a monorail conveyor for travel through a continuous airless shot blast room. This machine can clean about 15 tons of castings an hour. Cleaned castings subsequently are chipped and ground. Snagging equipment includes three double-wheel stand grinders. Cores removed at the knockout are crushed, mixed with water and flushed to the settling basin.

The heavy casting cleaning area employs swing grinding as well as the usual chipping and portable tool grinding operations. Facilities here also include a pneumatic shot blast room and a welding booth. Any castings that require repair welding are first brought up to temperature in an adjoining preheat furnace. In addition to the overhead traveling cranes, several jib cranes are available in this area to handle the castings.

After final inspection practically all castings are spray painted. This priming coat is intended to prevent rusting, since the castings are stored outdoors for a time prior to machining.

Brass Foundry—The department in which brass and stainless steel castings are made is a self-contained unit occupying most of an 80 x 230-foot area at the northeast corner of the foundry building. Molding equipment currently consists of four squeezer machines served by overhead hoppers. Molds are set out on roller conveyor lines for pouring and are carried by a transfer car from the ends of the lines to a floor shakeout station.

Sand falls through a grating to an oscillating conveyor for return by means of a bucket elevator to a 40-ton-capacity storage bin. Beneath this bin is a mulled capable of preparing 15 tons of sand an hour. The muller is located overhead within the framework of a tower from which a monorail leads to the molders' hoppers. Prepared sand from the muller is discharged into a hopper car. The car then is elevated to the monorail and automatically travels to the molding stations where the sand is dumped through a bottom gate.

THE UNITED WAY

Equipment for melting brass includes two gas-fired rotary type furnaces having a melting rate of 1000 lb an hour and two crucible furnaces of 135 lb capacity. Steel is melted in two induction furnaces, one of 1000 lb capacity and the other 600 lb. Furnace equipment and quench tank also are provided for heat treatment of castings.

Coremaking operations in the brass foundry are concerned to a large extent with fairly complicated work such as cores for pump impeller castings. Cores are baked in a small drawer type oven.

Cleaning of brass and steel castings is carried on at one end of this foundry area. The department employs a hydraulic sand blast unit, plus the usual portable tool operations.

Quality Control—In addition to careful inspection of finished products, close attention is paid by the foundry to quality of materials and

OPPORTUNITY TO BUY MODERN STEEL CASTING FOUNDRY

American Steel Foundries offers Newark, N. J. Works For Sale

Completely equipped, well maintained plant of 165,000 sq. ft. (one story building) on 10½ acre site with R. R. siding.

suitable for production of high and low alloy steel, grey iron, malleable iron, or non-ferrous castings.

Equipment includes overhead sand system . . . yard and plant cranes and conveyors . . . power plant . . . chemical and metallurgical laboratory . . . and efficient dust-collecting facilities.

Ample skilled and unskilled labor market. On-property parking for 475 cars.

Attractively priced at Far Less Than Reproduction Cost!

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work in process. Assisting considerably in the checking of metal composition is a spectrograph. It is used in connection with iron, brass and steel castings and can provide a complete analysis in 20 minutes. Regular chill tests are made on cupola metal, while a well equipped sand laboratory is engaged in constant checking of the properties of molding and core sand mixtures.

Working conditions in the foundry are ideal. Air contamination is minimized by efficient application of exhaust units at points where dust, fumes and smoke are generated. Most of the air exhausted to dust collectors represents compensating air brought in from outdoors at the exhaust points. This cuts heat losses in cold weather and prevents strong drafts through the building. In the winter additional filtered and heated air will be introduced to provide a supply about 10 per cent in excess of the total volume exhausted. Overhead unit heaters are supplied steam from the central power plant.

The foundry has seven dust collectors, three of them the dry type. Sludge from the four wet collectors is flushed to the settling basin that handles the cupola and core knockout refuse.

No Dust Accumulation

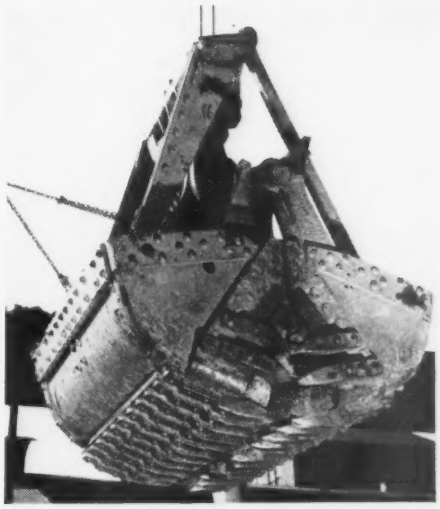
Dust is not permitted to accumulate on the floor, which is concrete throughout, while heat from hot castings is eliminated from the working level by the overhead location of the cooling conveyor.

Good use is made of natural lighting. It is supplemented by combination incandescent and mercury vapor lights which provide a general illumination of 35 foot-candles in the molding departments and cleaning room.

Modern facilities are incorporated in two large wash and locker rooms. These are located on opposite ends of the second floor at the north side of the building. The area between the two rooms is devoted to pattern storage. Patterns also are stored directly below on the first floor, adjoining the pattern shop. Complete equipment is provided for making and repairing patterns.

Lester B. Knight & Associates Inc., consulting engineers, Chicago, designed and supervised all site improvements and the installation of all utilities serving the plant; also designed and supervised the construction of the machine shop building, the foundry building and the boiler plant; engineered the foundry equipment layout, and, working closely with Fairbanks, Morse & Co. personnel, selected and supervised the installation of the foundry equipment.

BLAW-KNOX
DUAL-PURPOSE FOUNDRY BUCKET
Cuts Coke and Sand Handling Costs



HANDLES COKE WITH MINIMUM DEGRADATION

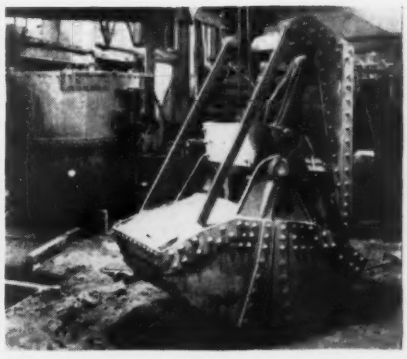
●

HANDLES SAND WITH MINIMUM LEAKAGE

Blaw-Knox "Shark Tooth" Single-Line Hook-On Buckets are the double-barrelled punch you need to cut the cost of rehandling coke, coal, sand and small limestone, *because they are dual-purpose buckets.* With liner plates attached, you can handle fine granular materials with minimum leakage. Without the liner plates, the "shark teeth" assure minimum degradation of coke.

BLAW-KNOX SINGLE-LINE HOOK-ON TYPE BUCKETS SOLVE AVERAGE OR UNUSUAL HEADROOM CONDITIONS

For extremely limited headroom, this ¾-yd. bucket requires only 6'7" operating headroom. Blaw-Knox Buckets designed specifically for low headroom conditions are also available in larger sizes.



For average headroom, there's a size and type of Blaw-Knox Foundry Bucket to meet a wide range of conditions. Write for Bulletin 2232 for details.

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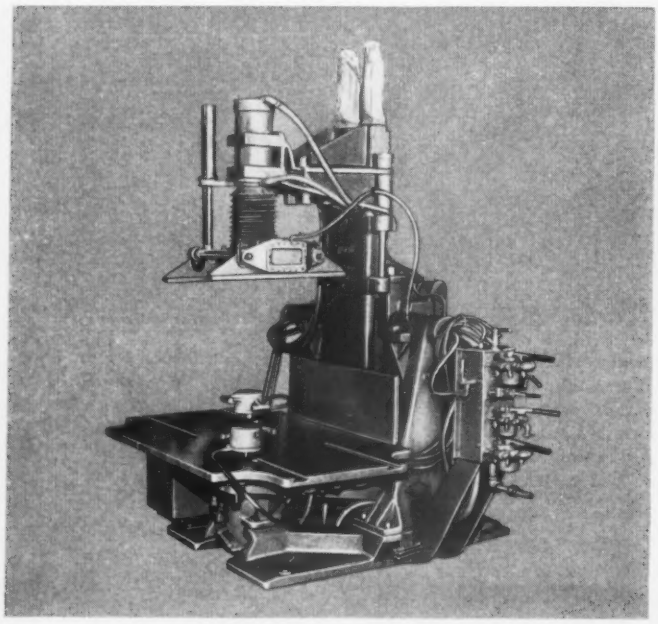
FOUNDRY BUCKETS
THE MOST COMPLETE RANGE OF SIZES AND WEIGHTS

(Advertisement)

Modern Equipment Saves Money For Foundries

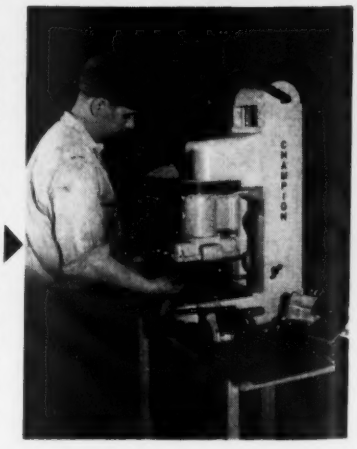
MAXIMUM CAPACITY, with full development of molding and core sand physical properties is essential at the Kensington Steel Company. This single Model "70" Speedmullor prepares over 270 tons of molding and core sand daily. Mulling and cooling of molding sand is accomplished in a total cycle of 70 seconds. *For full information write Beardsley & Piper, 2424 N. Cicero Ave., Chicago.*

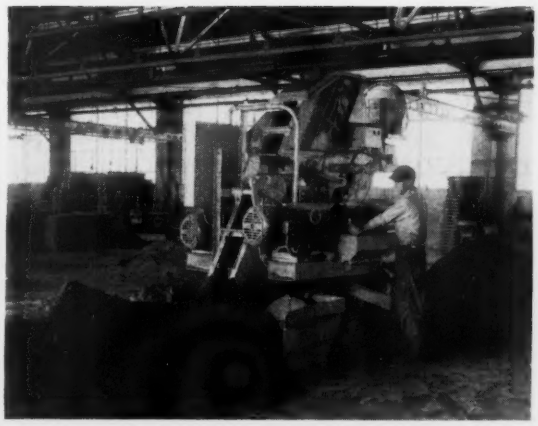
80 TO 100 LARGE MOLDS are rammed each hour by this remote controlled Hydra-Slinger at the Belle City Malleable Iron Company. Patterns for eight different jobs are mounted on Champion Speed-Draw Machines on a continuously rotating B&P Rotomold table. The Hydra-Slinger offers effortless, high-speed ramming for jobbing and production foundries. *Write now for full information: Beardsley & Piper, 2424 N. Cicero Ave., Chicago.*



JOB CHANGE DOWNTIME was a problem at one large gray iron foundry until this new J&J Jolt Rol-A-Draw with Automatic Adjustable Flask Equalizer and Automatic Pattern Clamps was installed. Pattern boards are mounted by a "flick" of a single lever, and various flask heights are automatically accommodated. J&J Rol-A-Draws are available with capacities to 10,000 pounds. *Beardsley & Piper, 2424 N. Cicero Ave., Chicago, will provide complete details.*

COREBLOWING FOR THE JOBBING FOUNDRY is made practical by devices like the quick-change magnetic blow plate holder on this CB 5 Core Blower at the W. D. Allen Mfg. Company. A permanent magnet device in the sand magazine clamps the blow plate securely in position. Locater pins insure exact positioning. To disengage a plate, the operator has only to pull it off. Full details are available. *Write to Beardsley & Piper, 2424 N. Cicero Ave., Chicago.*

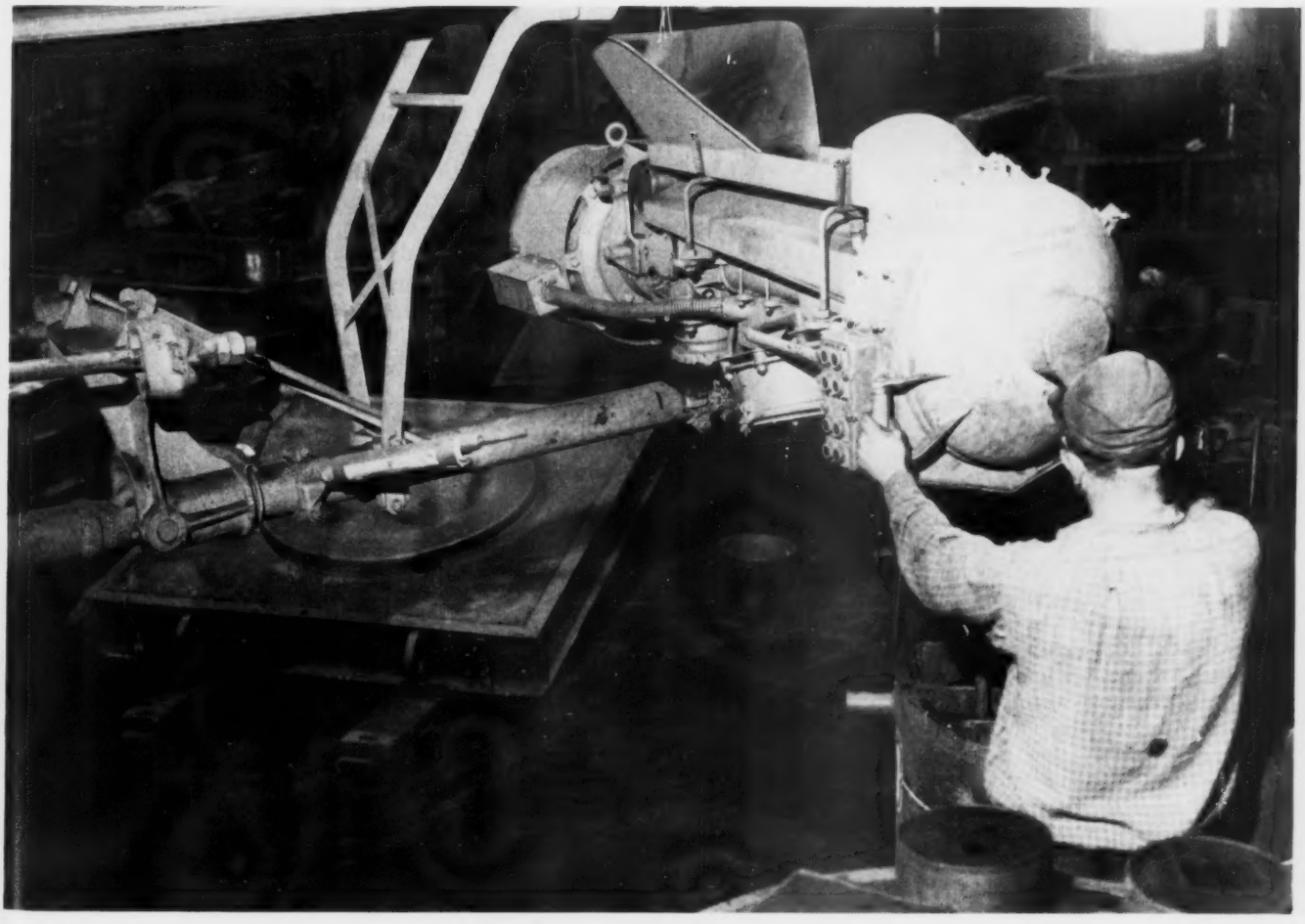




THE MOLDING SAND FOR UP TO 50 FLOORS is thoroughly prepared daily by this Nite Gang at the G & C Foundry. Shakeout sand heaped on the floors is thoroughly blended and then elevated and discharged over a magnetic separator. The scrap-free sand is then aerated, screened, aerated again and discharged into a pile or windrow ready for use. The machine is self-loading and self-propelling. *For full details, write Beardsley & Piper, 2424 N. Cicero Ave., Chicago.*

MOLDS FOR A LARGE NUMBER of different castings are produced efficiently by this Tractor Sandslinger at the Forest City Foundries. Cope and drag patterns are mounted on two portable pin-lift machines towed behind the slinger as it moves into the sand heap. Patterns are easily changed, and production from varied patterns is high. Effective mechanization has been attained at very low cost. *For full information write to Beardsley & Piper, 2424 N. Cicero Ave., Chicago.*

EXACT LABORATORY CONTROL of sand preparation requires laboratory mulling equipment that will do a thorough job of developing full sand physical properties in minimum time. The compact Lab Mulbaro is designed for fast complete mulling. Mulling bowls are removable to simplify laboratory procedures. *Beardsley & Piper, 2424 N. Cicero Ave., Chicago.*



THE MEECH FOUNDRY is small and space for molding is at a premium. Headroom is only 12′ and the molding bay is less than 30′ wide. Yet, Meech is getting the full benefits of slinger mechanization with a Motive Sandslinger which rams all of their molds except for squeezer work. *More information may be obtained by writing to Beardsley & Piper, 2424 N. Cicero Ave., Chicago.*

Processing of buildings and equipment for layaway without heat is exemplified by illustrations on this page. Such mothballing permits fast emergency activation. Above, air compressors in power house are partially dismantled . . .

. . . Swing grinders were stored in rows on planks laid on the floors. Note shrouding on the motors . . .

How To Mothball a Steel Foundry

By ERLE ROSS
Chicago Editor

AFTER World War II a number of government-built plants for manufacture of military goods were shut down. With no foreseeable future need for these plants, some were sold and some remained in government ownership either by intent or because they failed to attract buyers. In a few of those held, little if any effort was made to keep up the property. Consequently, when the Korean situation forced the United States to rearm in 1950, reactivation of some of the abandoned plants proved complicated and enormously expensive.

With passing of the Korean crisis in 1953, these plants once more were ordered closed, but this time the government wisely chose to "lay away" the facilities so as to have them available quickly and completely in event of another emergency. A shining example of the new approach to the nation's military preparedness is the outstanding "mothballing" job completed recently at the huge Cast Armor Plant in East Chicago, Ind. In size and scope, this project has no parallel.

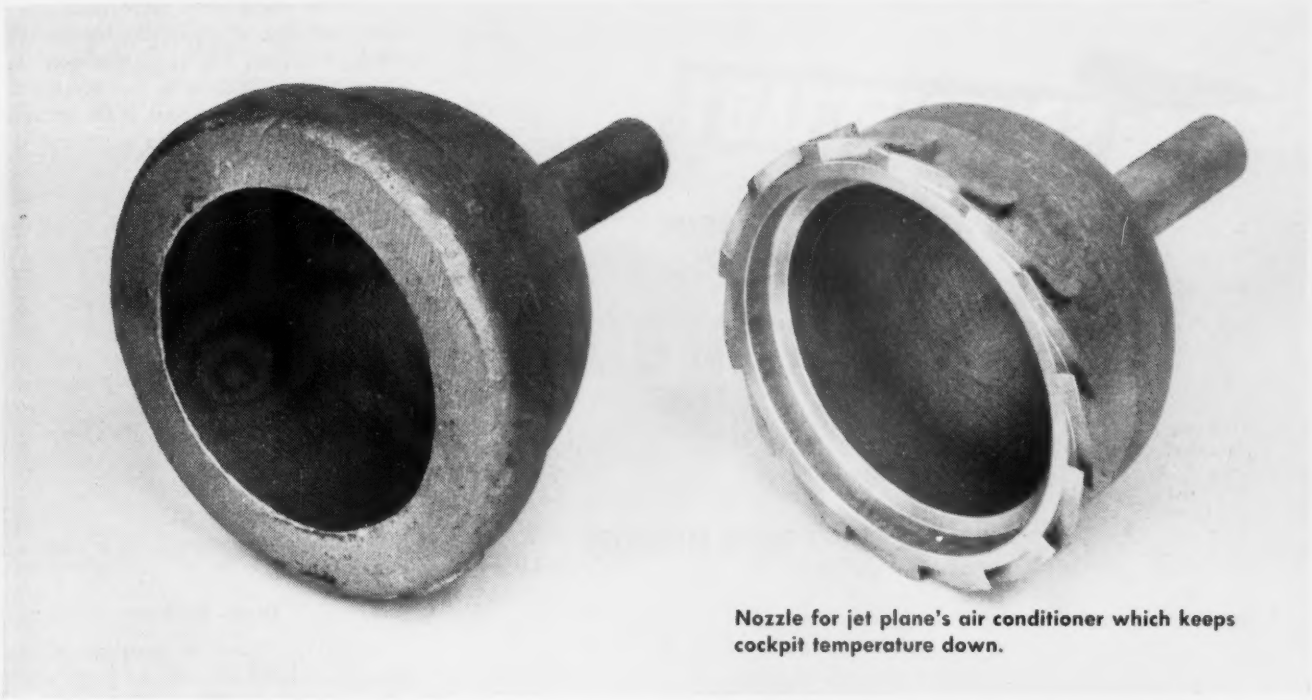
American Steel Foundries, Chicago, built the plant in 1942 and operated it for the government to make cast steel military tank armor. It was known as Defense Plant Corp. Plancor 269, a subsidiary of the Reconstruction Finance Corp. The site consists of approximately 94½ acres situated on the Indiana Harbor Canal. There are about 34 acres under roof with buildings nearly 1/3-mile long. Original construction cost was $26.5 million.

The original project included six open-hearth furnaces, each of 30 tons rated capacity; 40 gas-fired heat treating furnaces; and four 760-hp boilers.

Sand preparation, coremaking, molding, pouring, shakeout, and a portion of the roughing operations in cleaning of castings, are located in the main foundry building, 260 x 1600 ft with 47-ft height clearance. The open-hearth department is contained along an extension in front of this building, 94 x 600 ft. Cleaning, heat treating, finishing and inspection departments are in two exten-

(*Continued on page* 196)

Planer looked like this after shrouding. Note the V.C.I. powder and the glass windows through which the tool is to be inspected periodically for any rusting



Nozzle for jet plane's air conditioner which keeps cockpit temperature down.

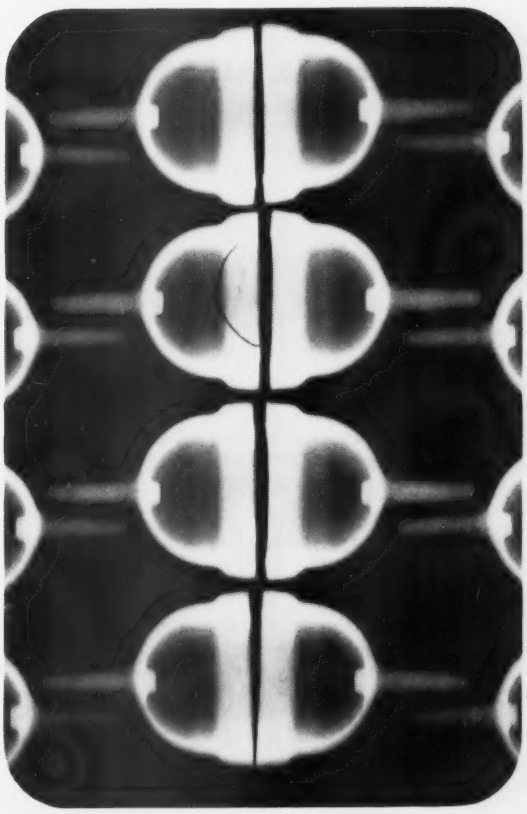
RADIOGRAPHY *says:* "O.K. to Machine"

COMPLEX MACHINING is required to transform this casting into the precision nozzle of a jet plane's air conditioner

Fourteen intricate, curved vanes are cut in the rough casting's rim. Tolerance is .002 inch. This means plenty of high-cost machine time—which could be a total loss if it is left to the cutting tools to find any defect in the casting.

Radiography avoids that . . . shows up shrink or other faults before machining is begun. Only those castings proved sound are worked. Time and money both are saved.

Easy to see, isn't it, how radiography pays off? And if you would like to know other ways it can help you, like improving yield in production runs, here's a suggestion: Talk it over with your x-ray dealer. Or, if you like, drop us a note saying, "Send me a free copy of Radiography as a Foundry Tool."



Radiograph shows castings with "shrink"—saves costly machining time.

EASTMAN KODAK COMPANY
X-ray Division
Rochester 4, N.Y.

Radiography . . .

another important example of Photography at Work.

Kodak
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SCHENECTADY

SP 7542 SHELL MOLD RESIN

Tops in all three

EXCELLENT HOT RIGIDITY

SUPERIOR TENSILE AND TRANSVERSE STRENGTH

HIGH "POURING" STRENGTH

Test after test is proving it in foundries everywhere. Let us show you how these three advantages of SP-7452 Shell Mold Resin will improve your operation.

EXCELLENT HOT RIGIDITY—will assure straight, rigid shells—no warping. SUPERIOR TENSILE AND TRANSVERSE STRENGTH—will give you stronger, more uniform shells.

HIGH "POURING" STRENGTH—allows you to cast to closer tolerances, eliminates oversized and warped castings caused by resin relaxation. It will pay you to investigate.

GET THE FACTS ON SCHENECTADY SHELL MOLD RESINS

Our new catalog gives full technical information on shell molding processes, selection of resins, etc. Mail the coupon for your copy today.

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City Zone State

(*Continued from page* 194)

sions running at right angles to the main building. One extension is about 170 ft wide and the second is double that width, and both extend 960 ft in the rear of the main foundry building.

To the west of the cleaning, heat treating and finishing buildings is another long building extending at right angles to the main foundry building in which the service departments, namely, the repair and maintenance machine shop, pattern shop, stores and supply departments are located, and to the west of this building, along the ship canal, are located the commissary building, boiler house, compressor room, and other buildings including an acetylene generator house, fuel oil pump house, etc.

Gives History

From the time of pouring of the first heat of steel Oct. 1, 1942, until close of World War II in 1945, the plant was under operation of American Steel Foundries. From end of the war until the first of 1951, the plant stood idle and during that period was advertised for sale by DPC. Jurisdiction reverted to DPC on Oct. 31, 1945, and was held by it for several weeks, although officially it was transferred to National Plant Conversion Corp. on that same date.

The plant was transferred to War Assets Administration Mar. 15, 1946, and it retained custody until June 30, 1949. On July 1, 1949, McGraw Construction Co. was installed as custodian under General Services Administration and retained control until the plant was taken over under direct jurisdiction of GSA on Apr. 1, 1950.

It can be understood that with the temporary tenancy of the several unorganized federal agencies having jurisdiction, proper responsibility and upkeep of the plant was lacking. None of them appeared to have a plan or program for maintaining the real, installed or personal property.

GSA Public Buildings Service Division retained control until Feb. 27, 1951, when it was transferred to the Department of the Army by lease agreement dated Feb. 10, 1951. On Dec. 19, 1950, American Steel Foundries was commissioned to reactivate the plant through execution of definitive contracts. The plant was officially placed in control of the company on Feb. 27, 1951.

On June 26, 1951, the first heat of steel was poured into castings for

(*Continued on page* 198)

time to be bold

Orders harder to get? Competitive pressure increasing?

Where is the management who won't agree it's time to urge the sales force to fight harder—to step up its sales calls—to develop more new customers?

Grabbing the initiative in times like these is what makes new leaders. The company that steps out boldly today capitalizes on competitive weakness. It pushes volume to win a larger share of available business. It improves its industry position and challenges old line leaders.

Yes, this is the time to be bold—in selling—*and in advertising.* The company that aspires to leadership makes no *little* plans.

It hits—and hits hard with everything it's got. It demands that its advertising work harder—that its impact be increased—that its contacts be stepped up. Alert management today is giving advertising *more* jobs to do, in order that its sales force can become *more productive.* Has your company raised its sights to fight harder with advertising?

THE PENTON PUBLISHING COMPANY

PENTON BUILDING • CLEVELAND 13, OHIO

(*Continued from page* 196)
shop equipment and on June 28 the first heavy armor heat was poured. Peak production was reached in October, 1952. First major cutback in production was made Jan. 2, 1953, after which followed progressive scaling down. Last open-hearth heat was tapped July 10, and last piece of cast armor was shipped Sept. 30, 1953.

At this time, the contract of American Steel Foundries with the Ordnance Corps was amended to provide for "laying away" the plant. This was to consist of protecting the machinery and equipment for long-term storage, without heat, in such a way that the plant could be reactivated quickly, if necessary. By Jan. 31, 1954, this operation was about 98 per cent complete and was fully complete by mid-year.

The company and the Ordnance Corps then entered into two new contracts which now are in effect. One contract requires the company to protect and maintain the Cast Armor Plant by providing guard service and maintenance employees to inspect and make minor repairs to equipment, machinery, buildings and structures.

Second contract requires the company to provide supervision over the erection of dehumidifying hutments (buildings within a building) to be used for storage of government-owned equipment shipped to the plant from other government locations. Subcontractors hired by the company erect the hutments with approval of the Ordnance Corps. Arrangements under both contracts are on a cost reimbursable basis.

As previously indicated, slightly over six months elapsed between the time American Steel Foundries was commissioned in late 1950 to reactivate the plant and time of pouring the first castings. The extent to which the time interval has been shortened by the mothballing program is difficult to estimate, but it would be considerable and, in event of a sudden involvement in war, conceivably quite significant. Suffice it to say that at present the plant can be reactivated faster than the necessary patterns can be acquired and a working force assembled and trained.

Develop Necessary Procedure

The processing of buildings and equipment for layaway without heat can be defined as a protection to minimize rust, deterioration, corrosion or damage after cessation of production operations. American Steel Foundries was given some instructions in the way of Ordnance Corps specifications which were combined with the company's ingenuity in the preparation of specifications appropriate for the Cast Armor Plant. Purpose of this article is to describe some of the job which has attracted much favorable comment from officials of the Chicago Ordnance District.

First step in the mothballing program was to prepare specifications to serve as a guide and to provide a standardized procedure. A part of the task of drawing up the specifications involved the selection of processing materials to be used in the mothballing operation. While most of the materials were standard items, a few had to be put through rapid tests to determine their effectiveness in certain uses and for extended service.

The latter applied particularly to asphalt - impregnated waterproof paper to be used in shrouding pattern equipment, etc.; wax-impregnated paper for use in conjunction with sealing instruments, welders.

(*Continued on page* 204)

SLY TUMBLING MILLS

THE STANDARD OF STURDINESS

The SLY name on your Tumbling Mills has been the Standard of Sturdiness for many years.

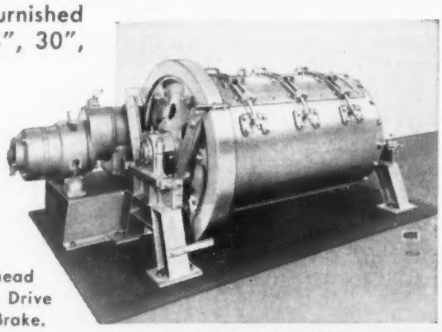
MODERN DESIGN THROUGHOUT — Anti-Friction Bearings, Direct Motor Drive.

STURDY CONSTRUCTION for Long Life, Low Maintenance.

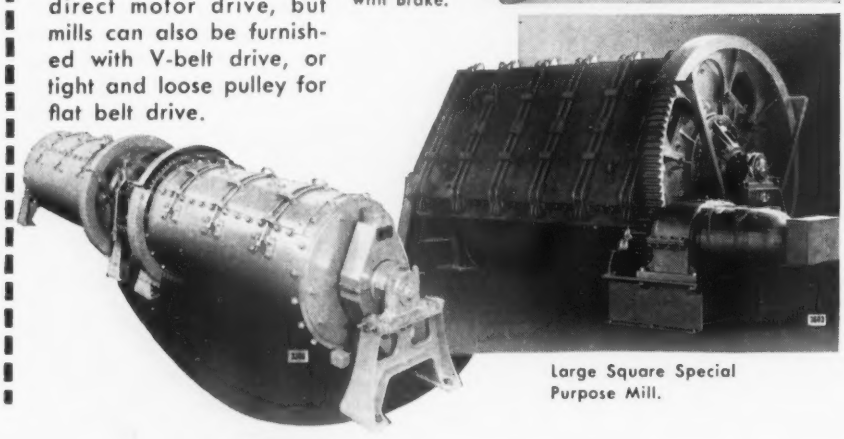
SLY TUMBLING MILLS can be furnished as follows: Inside diameters: 24", 30", 36", 42", and 48". Inside length from 36" up.

SPECIAL DESIGNS for Stove Plate, Soil Pipe, Waterpipe Fittings, Sprue Cleaning, Welding Rods, Cast Anchor Chain.

DRIVES FOR MILLS
For greatest flexibility we recommend individual direct motor drive, but mills can also be furnished with V-belt drive, or tight and loose pulley for flat belt drive.



Gearhead Motor Drive with Brake.



Large Square Special Purpose Mill.

THE W. W. SLY MANUFACTURING CO.

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Borden's phenolic resin core binder produces 2 tons of cores an hour in 180 sq. ft.!

You're looking into a dielectric core-drying unit turning out cores bonded with a Borden *phenolic* resin core binder . . . at The Atlantic Steel Castings Co., Chester, Pa. (The electrodes are raised for a better view.)

Over 2 tons of cores per hour have been produced on this unit. Cores up to 60 lbs. have been dried, and larger cores are possible. The finished cores are hard, clean, sharp and strong . . . produce sound, smooth castings.

And Atlantic's core-drying costs are *down* . . . about $9.00 for power for 8 hours of operation. Over $6,000 per year in labor have been saved, releasing men for other jobs. Storage space for a large core inventory is available for other operations. 95% of the rods in the cores have been eliminated.

Borden Foundry engineers worked with Atlantic from the start of the project. Perhaps they can help you set up one of the new, better production techniques for cores or molds. Address: The Borden Company, Chemical Division, Dept. F-104, 350 Madison Avenue, New York 17, N. Y.

THOR FOUNDRY PRODUCTS

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CHEMICAL DIVISION

Urea and Phenolic Resin Core Binders * Shell-Mold Resins * Core Spray * Core Paste * Parting Agents

GLOBE SILVERY PIGLETS

offer many advantages

Globe . . .
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offer • • • • Accurate silicon control with all grades ranging from 6 to 16 percent silicon.

- Uniform grain structure free from kish.
- Average weight of 15 pounds, which can be charged by hand.
- Ease of identification and handling due to shape and size.
- Uniform melting and even silicon distribution in the cupola.
- A virgin iron without synthetic binders, which can be easily handled by magnet.
- No problem of waste due to disintegration.

We invite you to write us direct for technical or other information

globe iron company JACKSON, OHIO

SILVERY PIG and FERRO-SILICONS
GLOBE
SINCE 1872

SALES REPRESENTATION

PICKANDS, MATHER & CO.; Chicago, Ill., Cleveland, O., Erie, Pa., St. Louis 1, Mo.
CLEVELAND-CLIFFS IRON CO.; Cleveland 14, Ohio
KERCHNER, MARSHALL & CO.; Cleveland 14, Ohio
MILLER AND CO.; Chicago 4, Ill., and Cincinnati 2, Ohio

For sales information, contact our nearest Sales Representative.

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● For further information on helpful literature, trade publications, and new equipment descriptions, please refer to IDEAS FOR FOUNDRYMEN insert and return cards on page 243.

FOUNDRY Readers Service

FIRST CLASS
Permit No. 36
(Sec. 34.9 P.L.&R.)
Cleveland, Ohio

BUSINESS REPLY CARD
No Postage Stamp Necessary if Mailed in the United States

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FOUNDRY
Penton Building
Cleveland 13, Ohio

Readers Service Dept.

OCTOBER 1954

IFC	33	66	93	168	206	246	267B	279B
2	34	67	94	170	207	247	268	280TL
4-5	37	68	95	172	208	249	269	280BL
6	38	69	96	173	209	250	270T	280R1
7	39	70	97	174	210	251	270B	280R2
8	40-41	71	98	176	211	252	271L	280R3
9	42	72-73	99	177	212	253	271R	280R4
10	43	74	100	179	213	254T	272T	281T
11	44	75	101	180	215	254B	272B	281BL
12	45	76	102	181	216	255	273L	281BR
13	46-47	77	137	182	218-9	257	273R	282L1
15	48	78	139	184-5	221	258T	274T	282L2
16	49	79	141	187	223	258B	274B	282L3
17	50-51	80	143	188	224	259L	275R	282R1
18-19	52	81	145	189	225	259R	277T	282R2
20	53	82	147	190	226	260T	277BL	282R3
21	54-55	83	148	191	229	260B	277BR	283T
22-23	56	84	150-1	192-3	231	261L	278L1	283BR
24	57	85	153	195	232	261R	278R1	304L
25	58	86	155	196	235	262	278-2	307TL
26	59	87	157	198	237	263	278L3	307BL
27	60	88	158	199	238	265	278R3	307R
28	61	89	160-1	200	239	266L	278-4	308
29	62	90	163	203	242	266R	279TL	IBC
30-31	63	91	167	205	245	267T	279BL	OBC
32	64-65	92						

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CITY & STATE _____

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FIRST CLASS
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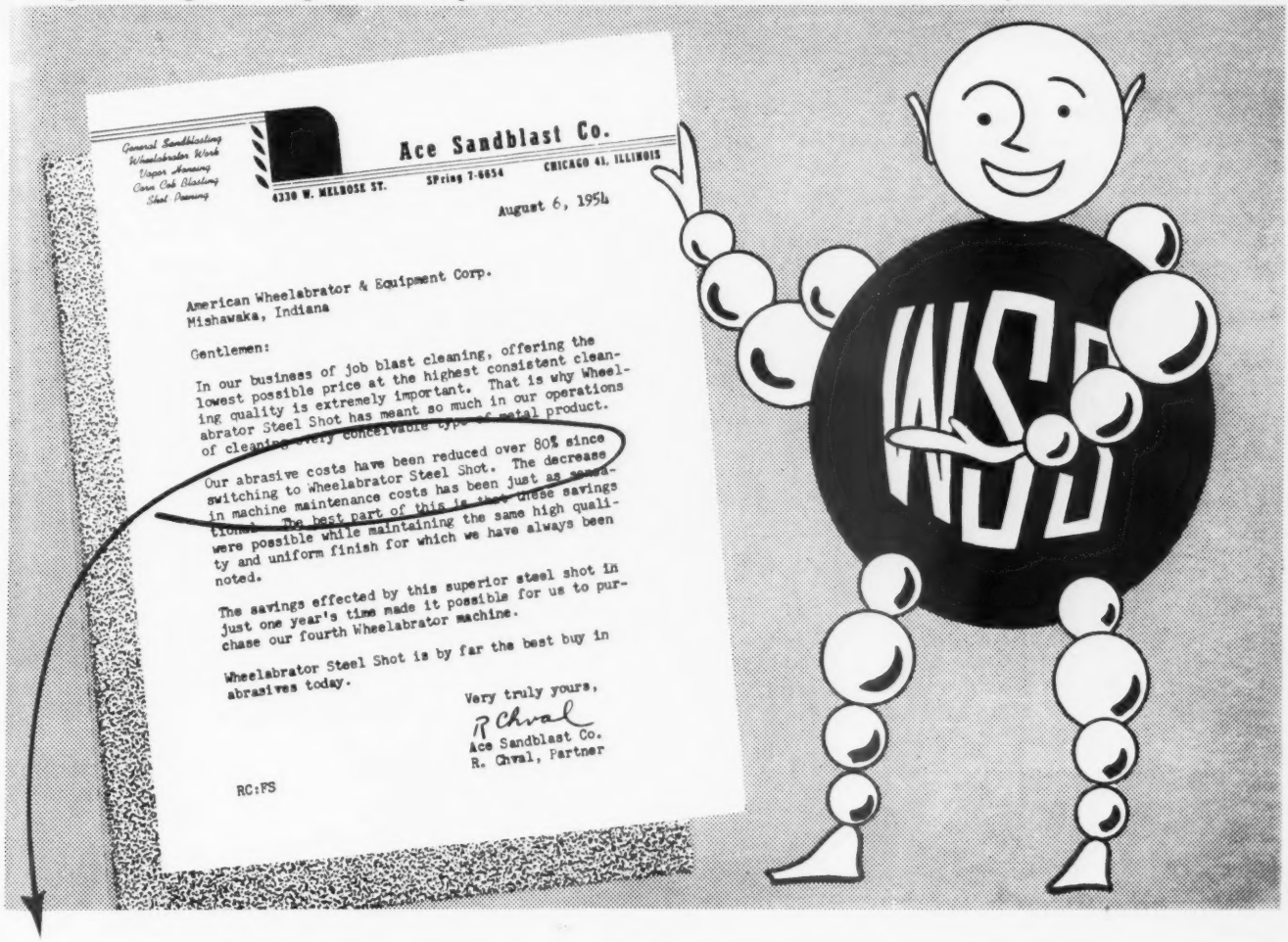
● For further information on helpful literature, trade publications, and new equipment descriptions, please refer to IDEAS FOR FOUNDRYMEN insert and return cards on page 243.

FOUNDRY Readers Service

pioneering developments keep **WHEELABRATOR®** *STEEL SHOT first in abrasives*


Ace Sandblast Co.
4230 W. MELROSE ST.
SPring 7-6654
CHICAGO 41, ILLINOIS
August 6, 1954
American Wheelabrator & Equipment Corp.
Mishawaka, Indiana
Gentlemen:
In our business of job blast cleaning, offering the lowest possible price at the highest consistent cleaning quality is extremely important. That is why Wheelabrator Steel Shot has meant so much in our operations of cleaning
product.
Our abrasive costs have been reduced over 80% since switching to Wheelabrator Steel Shot. The decrease in machine maintenance costs has been just as sensational. The best part of this is that these savings were possible while maintaining the same high quality and uniform finish for which we have always been noted.
The savings effected by this superior steel shot in just one year's time made it possible for us to purchase our fourth Wheelabrator machine.
Wheelabrator Steel Shot is by far the best buy in abrasives today.
Very truly yours,
R Chval
Ace Sandblast Co.
R. Chval, Partner
RC:FS

"Our Abrasive Costs Have Been Reduced Over 80%"

Ace Sandblast Co. Gets Highest Quality Cleaning at Lowest Price with Wheelabrator® Steel Shot

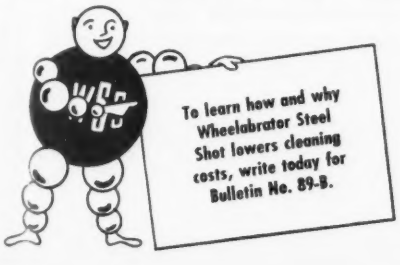
In the highly competitive jobbing blast cleaning business, customer acceptance of uniform surface cleanliness at just the right price makes the difference between success and failure. That's why Ace Sandblast Co., one of the largest and best equipped job cleaning shops in Chicago, sings such high praises for Wheelabrator Steel Shot.

Their prices are right and finish quality is uniformly perfect with their unbeatable combination of Wheelabrator airless blast equipment and Wheelabrator Steel Shot. Each of their four Wheelabrators is operating with this superior electric furnace steel shot.

Since switching to Wheelabrator Steel Shot, abrasive costs have been slashed 80%, the decrease in machine maintenance costs has been equally sensational. These savings enabled them to purchase an additional Wheelabrator making it possible for them to widen the scope of their cleaning activities.

This is the kind of report we're getting every day from users. It's not surprising. Wheelabrator Steel Shot is a proved money maker for every blast cleaning operation.

If you want to reduce your cleaning costs you ought to know more about Wheelabrator Steel Shot. Let us make a survey of your blast cleaning operations (no obligation, of course) — there's a Wheelabrator engineer nearby who is prepared to study your problem and recommend the SAE size Wheelabrator Steel Shot for your needs. Write today for details.



American
WHEELABRATOR & EQUIPMENT CORP.

Wheelabrator STEEL SHOT

505 S. Byrkit St., Mishawaka, Ind.

(*Continued from page* 198)

control panels, etc.; and plastic-coated, heat-sealed paper for use in storage of small tools and spare parts in sealed containers. It applied also to tape to be used in sealing instruments, welders, electric equipment, and the like.

In similar category was VCI vapor wrap paper for placing inside of sealed protective covering on instruments, welders, motors and other electrical equipment; heavy kraft-reinforced VCI vapor wrap paper to be placed inside of screen mesh enclosure of machine tools; and volatile corrosive inhibitor, or VCI powder, that acts as a rust inhibitor for introduction into interiors of instruments, motors, welders and other electrical equipment, and all airtight enclosures in which there is metal that might rust or oxidize.

Development of three materials—rust-inhibiting greases and oils, air-dry protective coatings that last indefinitely with no formation of rust underneath but still dissolve and wash off readily with commercial solvents, and VCI powder—make it possible to lay a plant away without previous costly disassembly and coating of the parts with cosmolene or other heavy coatings that do not remove easily.

Perhaps the most important was discovery of the compound called VCI, which acts as a reducing agent to combine chemically with oxygen. VCI powder is a powdered organic nitrite which slowly vaporizes into gaseous form with no immediate liquid phase. Once in gaseous form, it combines with whatever oxygen there is in a closed container and takes it permanently out of circulation. Where there is no oxygen to combine with water, there can be no oxide to form rust.

The general run of materials specified for use were rust-inhibiting greases for lubrication and protective films; rust-inhibiting oils for lubrication, protective films and hydraulic systems; air-dry protective coatings, solvents; a variety of paints for wood and metal; insulating varnish; strippable sealing compounds; and silica gel.

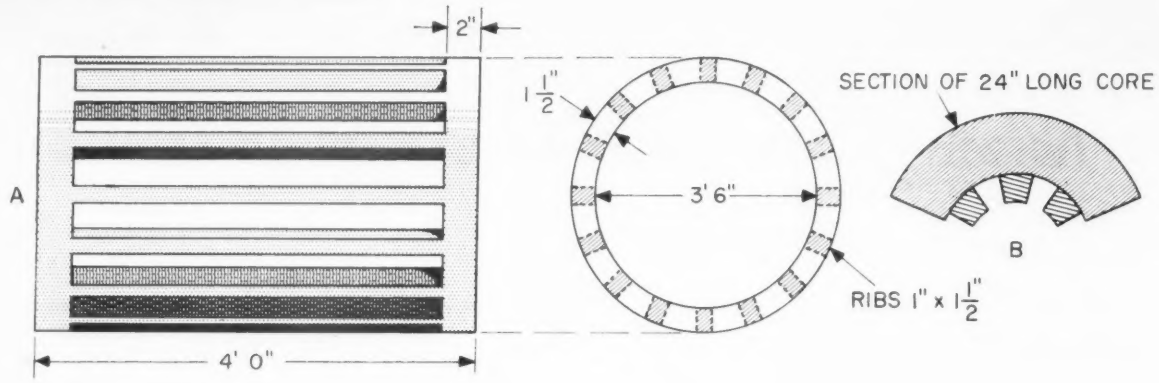
As an adjunct to the specifications book, samples of the various processing materials were mounted on a display board. This board served as a quick guide to workmen.

Obviously, it is impossible here to describe in detail the complete plant layaway, but a sufficient number of items will be elaborated upon to illustrate the thoroughness of the program.

Take enclosed motors, for example. The procedure was as follows: Clean all accessible surfaces and base using air and solvent. Remove existing lubricants for bearings and refill with rust-inhibiting oil or grease (former for sleeve type and latter for roller or ball type). Rotate motor by hand for lubricated film coverage. Apply protective coating to exposed bright and machined ferrous surfaces. Insert VCI powder into motor interior. Touch up where

(*Continued on page* 206)

HOW TO DO IT



Repair Casting Is Made Quickly Without Use of a Pattern

By E. R. WATERMAN
San Francisco

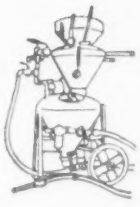
JOBBING foundries often are called upon to make castings in a hurry for repairs or alterations. Usually there is no time for making a pattern, and, furthermore, high pattern cost would not be justified for only one casting. Foundry methods for these quick jobs differ from those used in quantity production. An example is the cylindrical casting 3 ft, 6 in. ID by 4 ft high made by a western foundry. It had a series of slots around the barrel which ended 2 in. from the top and bottom. (see *A*)

The foundry in question did pulley work, using ring flasks 12 in. deep and approximately 3 ft, 6 in. ID. Inside core for the proposed casting was built of green sand rammed in these circular flasks, four high. Next, a series of twelve, 24-in.-long segmental dry sand cores, *B* slotted to form the bars and top and bottom rings of the casting, with inside surface curved to form an arc of the 3-ft, 6-in.-diam cylinder, were placed around the bottom of the green sand central core. Twelve similar cores were placed on top of the first row of cores.

Molding boxes were placed around the assembly and backing sand rammed between the cores and boxes to offer support to the cores during pouring.

Do you have any tricks of the trade tucked away with your foundry experience? Why not release them to fellow foundrymen? FOUNDRY will pay a minimum of $15 for each idea submitted and published. Send a photo or drawing with your idea

Cupoline for your Cupolas...



Cupoline Bondact Mix is proportioned for use in the Bondact machine. This combination makes contour patching simple, ends uncertainties of hand mixes, avoids joints and weak points. Moisture is easily controlled.

PUT CUPOLINE TO WORK WITH THE BONDACT MACHINE

Cupola patching with the BONDACT machine using Cupoline refractory is a continuous story of substantial savings. Smaller cupolas can be patched in as little as 10 minutes and the average cupola in less than 30 minutes.

Save yourself many cupola headaches. Get actual case histories of money-making conversion to the Bondact air placement method of patching cupolas. . . Better service than ever from three shipping points.

International MINERALS CHEMICALS

EASTERN CLAY PRODUCTS DEPT.

INTERNATIONAL MINERALS & CHEMICAL CORPORATION

General Offices: 20 North Wacker Drive, Chicago, 6

DIXIE BOND • BLACK HILLS BENTONITE • TRIPLACT • REVIVO CORE PASTE • REVIVO BOND • BONDACTOR • CUPOLINE • DURA PRODUCTS • WESTONITE

Weld steel castings with little or no pre-heat!

Match analysis! Save on cost of electrodes!

Do all three with these 7
P&H LOW HYDROGEN ELECTRODES

1. **70LB (E7016)** — Matches properties of Grade B and castings of similar analysis after heat treatment.
2. **P&H .25C (E7016)** — For castings repair where carbon is preferred to alloys for raising tensile strength. Lets you match both chemical analysis and heat-treating properties, a condition possible only with low-hydrogen coating.
3. **75LP (E8016)** — For 2% to 3% nickel steel castings. Charpy impact values of 20-35 ft. lbs. at −175° F.
4. **P&H .40C (E9015)** — For .40 carbon castings where you want to match both chemical and mechanical properties.
5. **AW2B (E9016)** — For repair welding of cast armor, "off analysis" and high-sulfur steels.
6. **P&H # 7 (E9016)** — Matches properties of Grade C and castings of similar analysis after heat treatment.
7. **90LH-2 (E10016)** — For high-tensile castings and alloy steels, such as SAE 8630, 4130, and comparable types, where the weld metal must match the heat-treating properties of the parent metal.

Get all the story on P&H Low-Hydrogen Electrodes. Write for Bulletin R-26.

P&H WELDING DIVISION
HARNISCHFEGER CORPORATION
4405 WEST NATIONAL AVENUE • MILWAUKEE 46, WIS.

the P&H *line*

TRUCK CRANES · DIESEL ENGINES · POWER SHOVELS · PRE-FABRICATED HOMES · ELECTRIC HOISTS · SOIL STABILIZERS · WELDING EQUIPMENT · OVERHEAD CRANES

(*Continued from page* 204)

required, using enamel. Shroud motor, using wax impregnated paper. Reinforce with wire if necessary.

Motor - generator welders were processed similarly to motors, then the unit was inserted into a shroud bag of wax impregnated paper. Before sealing, VCI powder was inserted in bag interior. The machine then was replaced on its carriage or casters, using fiber washers to avoid damage to bag.

Much care went into protection of electrical equipment such as line starters, disconnects, power distribution panels, circuit breakers, contactors, controllers, relays, limit switches, safety switches and pushbuttons. Fuses were removed, cleaned and inserted in plastic-coated, heat-sealed paper bags. All accessible surfaces were cleaned with solvents and paint touched up. Petroleum jelly was applied to fuse clips, pole faces, contacts and knife switches. Conduit and other openings were sealed with modeling clay and a VCI paper sheet placed inside the case. A teaspoon of VCI powder was placed in an aluminum foil tray in bottom of case and all door joints and other openings sealed with tape, oversprayed with strippable compound.

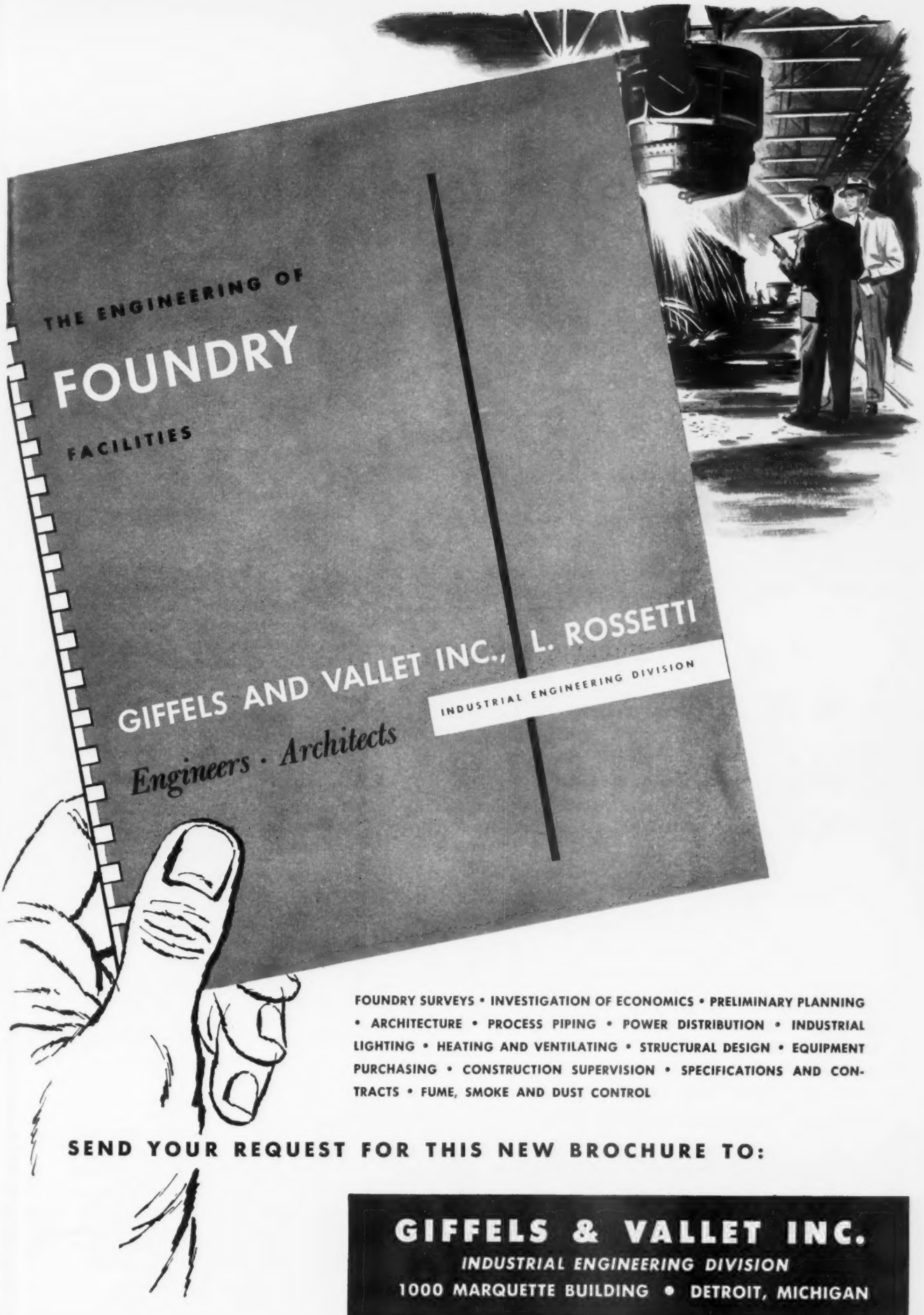
Refill Hydraulic Systems

Procedure for hydraulic systems was to drain the entire oil system and wipe out reservoir, then refill system with rust-inhibiting hydraulic oil. All packing glands were checked for leaks and protective grease applied to gland interior. Vents were sealed with tape. Water side of oil coolers was drained, filled with ethylene glycol, the latter drained and coils blown out. Protective coating was then applied to bright and machined surfaces. Damaged paint surfaces were touched up. Control, regulating and solenoid valves were wrapped with VCI vapor-wrap paper, then wax impregnated paper and secured with wire.

All valves 2½-in. size and smaller were left in open position with rust-inhibiting grease applied to the stem above the packing nut. On gate, globe and check valves above 2½-in. size, bonnet was removed and all accessible surfaces cleaned with solvent. Valve interior was coated thoroughly with rust - inhibiting grease. Packing was removed and gland filled with same grease. Valve then was reassembled and left open.

Hoists were treated as a class. The procedure included cleaning and retouching with paints, draining oil from gear cases and replacing with

(*Continued on page* 208)



FOUNDRY SURVEYS • INVESTIGATION OF ECONOMICS • PRELIMINARY PLANNING • ARCHITECTURE • PROCESS PIPING • POWER DISTRIBUTION • INDUSTRIAL LIGHTING • HEATING AND VENTILATING • STRUCTURAL DESIGN • EQUIPMENT PURCHASING • CONSTRUCTION SUPERVISION • SPECIFICATIONS AND CONTRACTS • FUME, SMOKE AND DUST CONTROL

SEND YOUR REQUEST FOR THIS NEW BROCHURE TO:

GIFFELS & VALLET INC.
INDUSTRIAL ENGINEERING DIVISION
1000 MARQUETTE BUILDING • DETROIT, MICHIGAN

(*Continued from page* 206)

rust-inhibiting oil, rust-inhibiting grease lubrication of bearings, processing electrical equipment as per electrical specifications, and applying protective coating to chain, sprockets and exterior surfaces.

Two methods were employed in processing machine tools. The first applied to equipment of small to medium value which would not warrant an expensive method of sealing and shrouding. The second applied to the more complex and costly precision machines which required more complete processing and shrouding. Machine tools were processed at their existing locations.

The first method included thorough cleaning, disassembling as necessary to remove chips and sludge, paint retouching, servicing hydraulic systems and sealing vents, lubricating, applying protective coating to all bright and machined surfaces, servicing electrical equipment and sealing it.

Machines to be shrouded were treated similarly, after which numerous additional steps were taken. VCI powder was dusted on exposed surfaces and introduced into interior mechanisms, overhanging portions were blocked with timber to take strain off the support, and 5-lb bags of silica gel desiccant were attached at rate of 15 lb per ton of machine to achieve an initial reduction of moisture within the shroud.

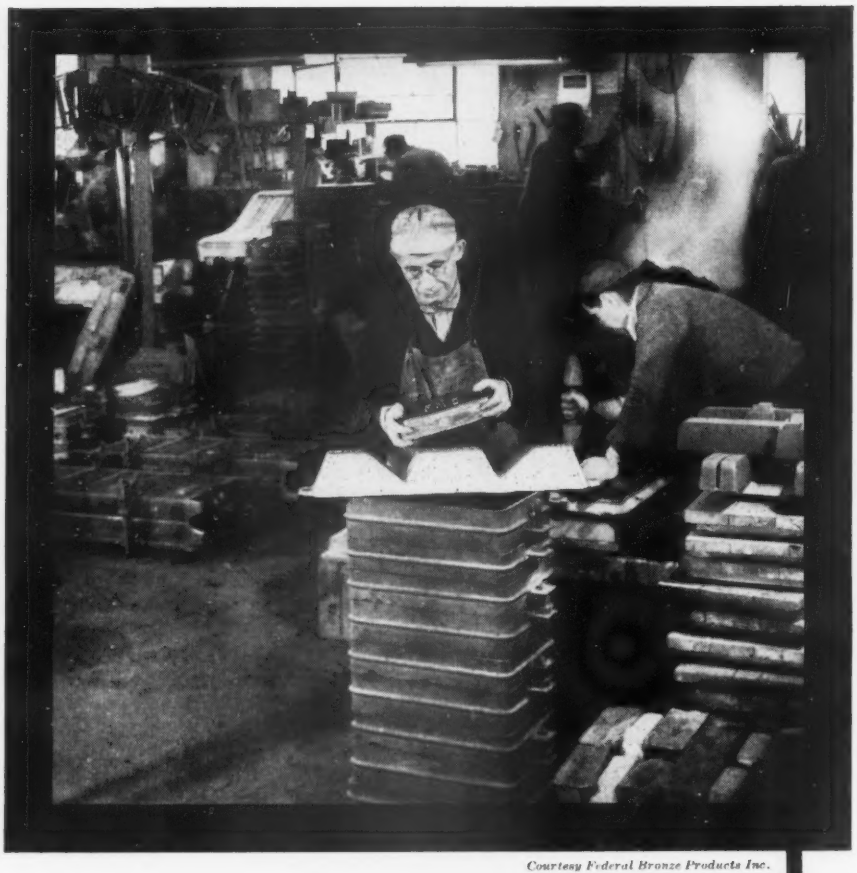
Machine Completely Enclosed

Next step was to wrap the machine with heavy kraft reinforced VCI vapor wrap paper, using tape, stapling and wiring to hold paper in position and to conform to contour. A complete enclosure was erected around the machine using vinyl-coated screen mesh, the mesh being attached to wood nailers anchored to the floor. Asphalt mastic was used to seal between the nailer and floor. Vertical joints of coated screen mesh were secured by stapling and bending over flat.

For future inspection and renewal of the inhibitor powder, the shroud had installed in it a tire valve, a glass viewing panel and a 110-v extension light with cord connection extending through the shroud to terminate in a male connection. The coated screen mesh then was sprayed with compound similar to automobile undercoating to a thickness of 1/16 to ⅛ in., intention being for the compound to form a complete seal.

It is contemplated that periodic inspection of shrouded machinery

(*Continued on page* 210)



Courtesy Federal Bronze Products Inc.

What's the miracle additive in brass and aluminum ingot?

Let's face it! There is nothing in the ingot but good metal, precisely alloyed to specifications. But when you buy your ingot from Federated . . . there is *an* extra. It's *good technical service.*

This service means that you can have practical help in your foundry from a Federated field expert . . . help which saves you headaches and dollars.

See Federated first for *any* non-ferrous foundry metal! Aluminum, brass and bronze alloys, magnesium alloys, deoxidizers and hardeners.

For your convenience Federated has 24 sales offices and 14 plants across the nation.

Federated Metals Division

AMERICAN SMELTING AND REFINING COMPANY
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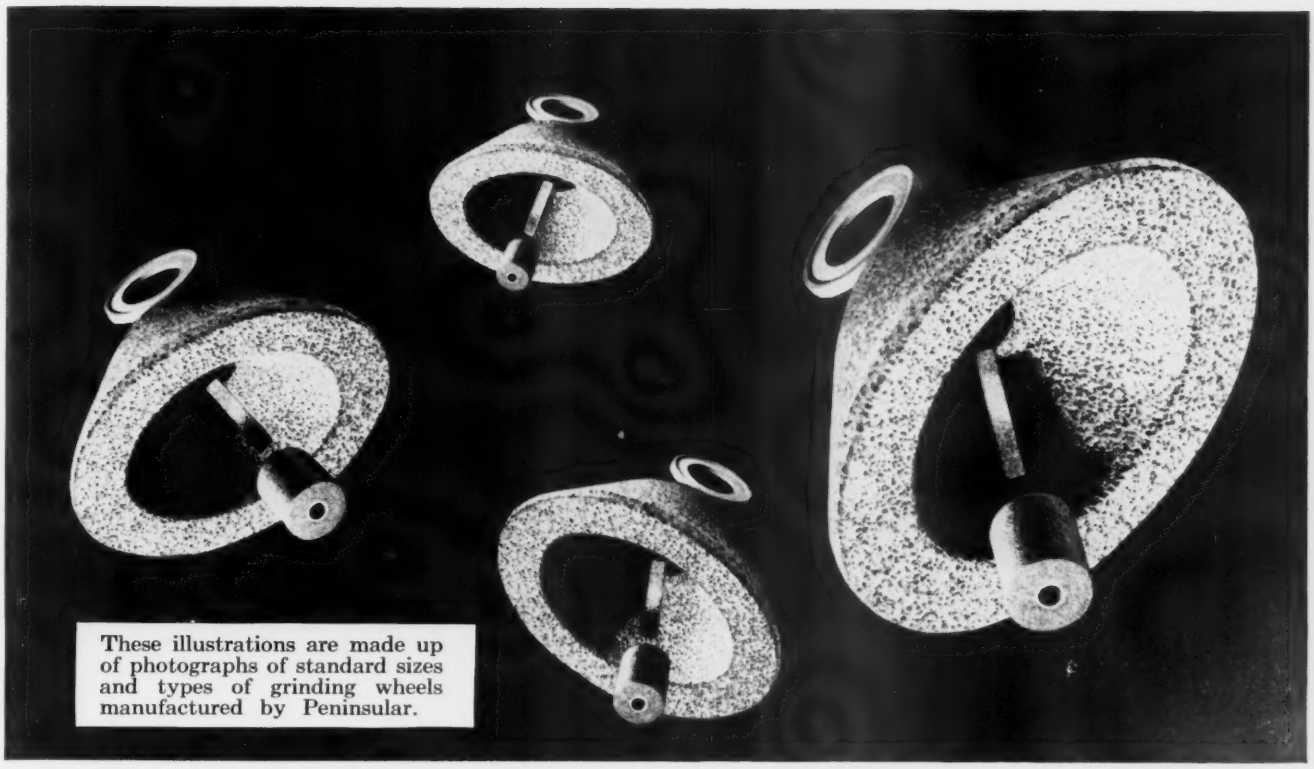
In Canada: Federated Metals Canada, Ltd., Toronto and Montreal

Federated first in the non-ferrous field AMD

Aluminum, Magnesium, Babbitts, Brass, Bronze, Anodes, Zinc Dust, Die Casting Metals, Lead and Lead Products, Solders, Type Metals



These illustrations are made up of photographs of standard sizes and types of grinding wheels manufactured by Peninsular.

Why PENINSULAR 4-Bell Grinding Wheels cost less per pound of stock removed

SERVICE—Our abrasive engineers study the grinding applications in your foundry to establish the exact specifications required.

PERFORMANCE—Building the wheel to your exact specifications means *more pounds of metal removed per cubic inch of abrasive used.* And that means *cost-reducing performance.*

QUALITY—Rigid standards of quality and safety are maintained. Precise control methods insure consistent duplication of your exact specifications.

DELIVERY—Peninsular's manufacturing methods are modern, flexible; assure fast delivery of your specific wheels to meet your inventory schedule.

"PLAY IT SAFE"

The **4-bell** color safety film, "Play It Safe," still available for showings. Explains how to avoid the major causes of breakage. Write: Peninsular Grinding Wheel Sales Corporation, Department B.

For more information and technical assistance, call or write today!

SPECIALISTS IN ALL TYPES OF RESINOID AND VITRIFIED BONDED WHEELS FOR THE FOUNDRY

CUT-OFF
SWING FRAME
FLOOR STAND
ALL PORTABLE TYPES
MOUNTED POINTS
PENFLEX

DISTRICT OFFICES: ***Buffalo 14,*** 3053 Main St., WIndsor 0048 • ***Chicago,*** 5610 W. 63rd St., RAndolph 6-1496 • ***Cleveland 20,*** 3510 Lee Rd., Shaker Hts., WAshington 1-2181 • ***Detroit 7,*** 729 Meldrum, LOrain 7-4193 • ***Indianapolis, 24,*** 150 S. Senate, MElrose 5-6588 • ***Philadelphia,*** 303 Liberty Bldg., Jenkintown, Pa., OGontz 7836 • ***Pittsburgh 34,*** 3829 Willow Ave., Fieldbrook 1-5066

PENINSULAR

GRINDING WHEEL SALES CORPORATION

Plants and General Offices: 729 Meldrum, Detroit 7, Michigan

INDIVIDUALLY PENINSULAR ENGINEERED
SINCE 1889

(*Continued from page* 208)

will be made to detect evidence of rusting and to renew the VCI powder through the tire valve when no powder is visible through the viewing panel.

In cases of small portable machines, practice was to insert them into plastic-coated, heat-sealed paper bags instead of coated screen mesh enclosures. VCI powder was inserted before sealing and the bags stored on tables or wood blocking.

Lift trucks, fork trucks, shop mules, tractors and tractor shovels were cleaned, lubricated and entire exterior surfaces repainted. Batteries were removed for disposal by sale. Protective coating was applied to all machined surfaces including drive chains, sprockets, etc. Tires were cleaned with solvent, then the equipment was blocked up to relieve tire load. Pneumatic tires were left inflated.

Overhead cranes, gantry cranes and open-hearth charging machines and their component parts were cleaned and greased with rust-inhibiting grease and hook blocks supported in up position using a separate cable sling. Protective coating was applied to gears, cable drums, couplings, driveshafts and other machined surfaces. Rust-inhibiting grease was applied to all cables.

Dust collectors, both dry and wet types, were cleaned inside and out, some parts disassembled, protective coated and reassembled, protective coating applied to sludge conveyors, chains and bright and machined surfaces, bearings and pivots lubricated with rust-inh.biting grease. Tension on V-belts was eased, blast gates closed, fan stacks capped, and inside and outside surfaces painted.

Hand tools, such as grinders, rammers, chipping hammers and concrete breakers, were disassembled and cleaned and rammer butts and wheels stored in designated locations. Fiber vanes in grinders were removed and discarded. Rust inhibiting oil was applied before reassembly. The tools then were stored in steel barrels filled to the top with new air tool oil of proper viscosity. Barrel tops were sealed with tape.

Oxyacetylene equipment such as torches, regulators, gougers, flame washers, etc., were cleaned and had torch tips removed. Each tool was wrapped in wax impregnated paper and sealed in a plastic-coated, heat-sealed paper bag.

Prepare Open Hearths

In preparing the six open-hearth furnaces for layaway, no major removal of masonry materials was performed except in cases that presented a safety hazard. All slag was removed, leaving bulkheads open. After priming, aluminum paint was applied to accessible steel surfaces above the floor line, including chutes, material hoppers, etc., and damaged paint surfaces below the floor line were touched up. Water and sewer lines were blown out.

Burner equipment was removed and cleaned, coated with rust-inhibiting grease, and stored in the open-hearth tool crib. Doors, jambs, burner parts and other water-cooled jackets were drained and flushed out with ethylene glycol. Doors and jambs were cleaned and enamel painted. Doors left in place on furnaces were blocked open for ventilation.

Sand and other foreign materials were removed from all foundry equipment, pits, tunnels, foundations, etc. All portable foundry equipment such as production flasks, ladles, stands, mold driers, and the like, were stored in a compact man-

(*Concluded on page* 212)

PROMPTLY your molten brass, aluminum or magnesium registers its temperature when measured with a Marshall Enclosed-Tip Thermocouple. Checking metal temperatures in this way enables you to pour at just the right heat, thus reducing chance of porosity, mis-runs and other flaws.

By thus eliminating the hazards of underheating or overheating, Marshall Thermocouples aid in speeding your casting output, improve quality of castings, reduce your costs of operation.

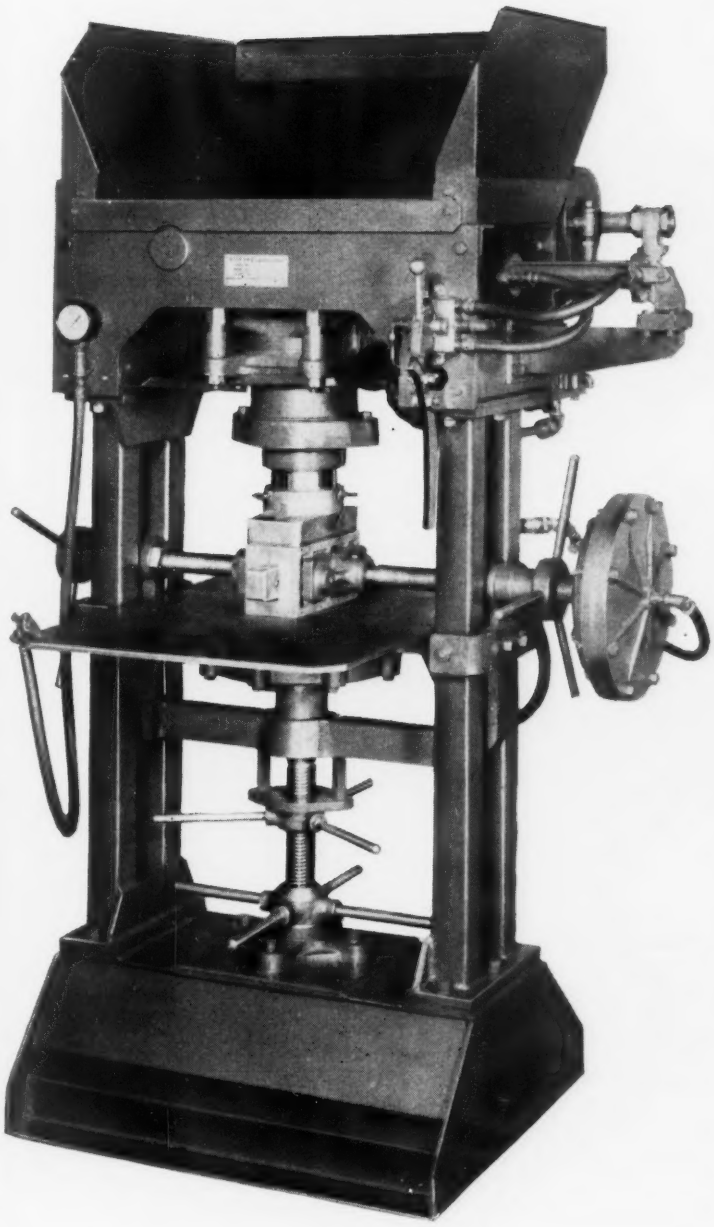
Marshall Thermocouples have become standard tools in the nation's foundries. They are made in two types —for use at the furnace or ladle.

Write us for descriptive Catalog.

L. H. MARSHALL COMPANY
270 W. Lane Ave Columbus 2, Ohio

Marshall
THERMOCOUPLES

Redford NO. 4 CORE BLOWER



Designed to add more power, capacity and speed to traditional Redford simplicity, flexibility and convenience, the No. 4 Redford superbly fills the need for a truly fast and flexible machine to blow cores from a few ounces to 10 lbs.

There is no need for the operator to wait for the machine at any time—the fast operating cycle permits immediate release of the core box after the cores have been blown.

Exhaust air is utilized to thoroughly fluff the sand remaining in the sand magazine after each blow, thus reducing the possibility of cratering.

Magazine heads normally furnished with the No. 2 Redford machine can be used with the No. 4 Redford. Larger new type magazine heads are also available as standard equipment.

A completely new fully adjustable clamp for vertically parted core boxes simplifies core box set up—when not needed the clamp units can be adjusted all the way out or completely taken off the machine.

Redford No. 4 users report production up to 8 boxes per minute using only one core box per machine. To get complete information write for Specification Bulletin 4.

Cores at right illustrate wide range of work that can be done with the Redford No. 4 Core Blower.

Redford IRON & EQUIPMENT CO.

20733 GLENDALE AVENUE • Phone KEnwood 1-8611 • DETROIT 23, MICHIGAN

(*Concluded from page* 210)

ner at the east and west ends of the No. 1 foundry bay. Aside from removing sand accumulations, the processing of foundry machines followed much the same pattern of other plant equipment.

Special mention, however, should be made of conveyor belting and conveyor rolls. The belting was thoroughly cleaned, coiled and stored on wood timbers, then shrouded with wax impregnated paper. In the cleaning and lubricating of the rollers in roller conveyors, disassembly of the rollers was found to be quicker than servicing without disassembly.

Major production patterns had protective coating applied to pins and bushings and were allowed to remain inside of insert flasks stored on level rails in designated locations. Loose pieces, like risers, were placed on top of related patterns. A portable mold drier was placed on top of pattern and insert, but when not available a corresponding size flask was used instead. Then a hip-shaped roof was constructed over the flask, using scrap lumber and roofing paper. Gables of the hipped roof remained open for ventilation.

Patterns for shop castings as well as coreboxes, templates and gages, after cleaning and treatment, were stored on wood timbers inside concrete sand bins. The bins then were covered with roofing paper.

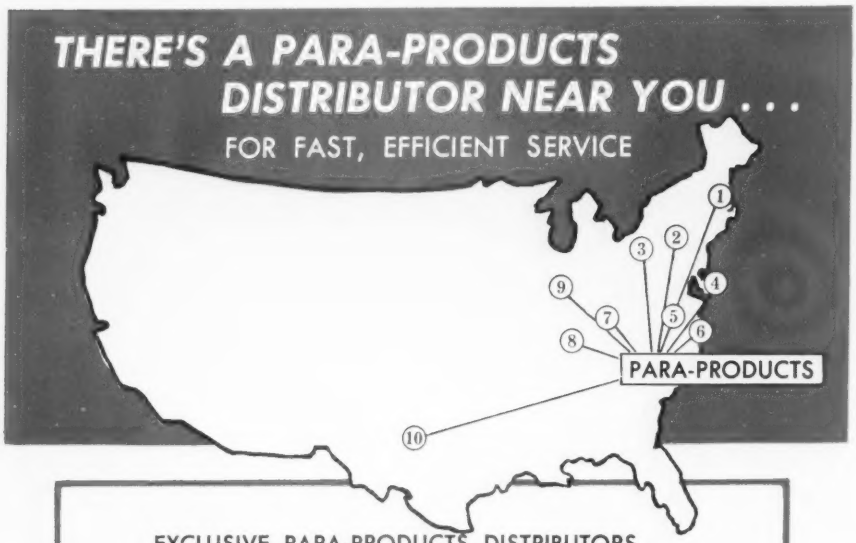
Careful attention was given to furnaces and ovens, including heat-treat, mold driers, core, casting preheat and casting heaters. Aside from cleaning, lubricating, applying protective coating and painting, gas burners were disassembled, treated with protective coating and reassembled. Doors were blocked open 8 in. to insure ventilation and tension on door counterweights was eased by blocking.

Gas lines and tanks which contained oxygen, acetylene and fuel gas (propane) were discharged of their contents, purged completely with nitrogen, and left sealed and capped. In case of the propane system, a nitrogen pressure of between 1 and 2 lb will be maintained. A weekly check is made and when pressure falls to 1 lb or less, nitrogen in cylinders is added at the purging connections. Maintaining the propane system rust free is most important. Any rust would make the system inoperable in the future because of the delicate Askania mechanism through which propane is converted from liquid to gas. Moisture-free nitrogen has no oxygen to form rust or oxidation.

Mothball Compressors

Another indication of serious intent to preserve equipment in the Cast Armor Plant was the procedure followed in processing the large stationary air compressors. Just to mention a few highlights, the heads from both the air and the steam cylinders were removed, and the water blown out. Then they were coated with protective coating and stored in wooden crates. Water jackets were blown dry and cleaned of sludge deposits. Steam and air pistons, piston rods, crossheads, crank rods and valve gear, were removed, coated, and stored in wooden crates. Certain other component parts were treated similarly.

Bearing caps were removed and the flywheel and main shaft raised and supported by structural steel blocking. All bearing surfaces on the shaft and on the quarter boxes were coated. A view of the air compressors, partially disassembled, and the wooden crates for storage of parts is shown in the accompanying illustration.



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2. R. J. Denton Company, Syracuse, New York
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PARA-PRODUCTS HAVE A PLACE IN EVERY FOUNDRY
There's No Substitute for Quality

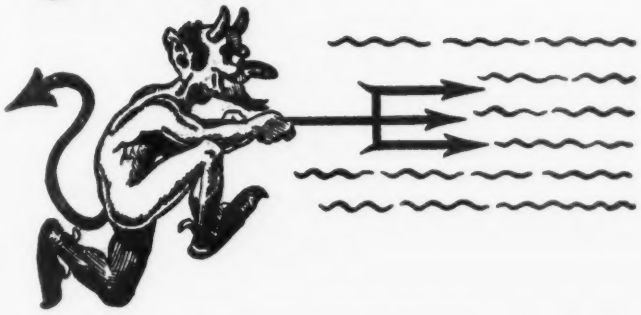
- PARASPRAY . . . The modern air-drying sand core and mold surface conditioner.
- PARACOAT . . . The most preferred pattern finish for ideal protection.
- BONISPRAY . . . The best dressing for permanent molds and die castings.
- PARAPLY . . . The superior modern replacement for shellac.
- PARASOLV . . . The multi-purpose solvent for thinning and cleaning.

ASK YOUR DISTRIBUTOR FOR CATALOG F-100 OR WRITE US

FOUNDRY RUBBER INCORPORATED

5200 RIVER ROAD WASHINGTON 16, D. C.

Soffel's



FLUXES and EXOTHERMIC COMPOUNDS

for all

Metals and Alloys

THERMOTOMIC "X" COMPOUND is an exothermic material which is molded and baked into necked down riser cores and inserts. It produces a temperature of 3500° F. and is used as ring inserts under the risers or feeding heads. Great savings are realized through reduced riser dimensions and cleaning costs. In conjunction with Thermotomic Compounds, Carbon Free Liquidizer No. 5 should be used on top of the metal in the heads.

THERMOTOMIC ABC—For aluminum and magnesium castings, necked down riser cores and inserts—prevents piping and shrinkage into castings. Soffel's ALX-31 Liquidizer should be used on top of the metals in the head.

THERMOTOMIC HoTop LIQUIDIZER — For short risers—saves 60 to 70% of feeding metal in the heads.

EXOTHERMIC CARBON FREE LIQUIDIZER—A feeding head compound for castings and ingots of ferrous and non-ferrous metals — saves metal and prevents piping and shrinkage.

CARBON FREE LIQUIDIZER AL-X31—For aluminum and magnesium feeding heads—prevents piping.

EXOTHERMIC INSULATING SLEEVE CORE COMPOUND—For riser sleeves—adds heat and prolongs fluidity of feeding metal in heads or risers.

DENSILTITE LADLE FLUX—For iron and semi-steel—reduces sulfur and phosphorus. Adds fluidity and temperature in pouring ladles—produces clean iron.

SOFFEL'S NON-FERROUS FLUXES

BB-2—For red brass, nickel and tin bronze pressure castings—removes sulfur, iron, phosphorous oxides and gas from brass and bronze.

SUPER BRASS FLUX—For brass and bronze—prevents oxidation of zinc.

BRASS REFINING FLUX—For cupola melting and open flame furnaces — prevents oxidation. Produces liquid slag and faster melting.

COVERALL BRASS FLUX—Removes gas and oxides from yellow brass and nickel silver.

RADIOCLARITE BRASS FLUX—For open flame furnace melting—increases fluidity, tensile strength, removes gas, oxides and iron.

AB-6 BRASS FLUX—For electric furnace melting of brass and aluminum bronze—keeps furnace linings clean.

KLEEN-ALL BRASS CLEANER—For use in bottom of pouring ladles or open flame furnaces to absorb liquid slag and keep the furnace and ladle linings clean.

BRASS ALUMINUM REMOVER — Removes all traces of aluminum from copper, brass or bronze.

HI-LED BRONZE FLUX—Holds lead up to 50% in copper without use of nickel.

NICKEL MONEL FLUX — Removes gas and adds fluidity to metal.

ALUMINUM BRONZE FLUX—A perfect deoxidizer for reducing aluminum and iron oxide in manganese bronze and aluminum bronze. Adds fluidity.

COPPERTITE FLUX—For high conductivity castings—removes cuprous and cupric oxides and gas from copper.

FERRO-OUT IRON REMOVER—Removes free iron or alloyed iron from brass, bronze or copper.

SOFFELITE ALUMINUM FLUX—Removes aluminum oxide and iron from aluminum and increases the fluidity and tensile strength.

MAGNALUM FLUX—For magnesium and aluminum alloys—removes gas and oxide and increases fluidity.

KLEN ZINC FLUX—A deoxidizer and purifier for zinc base pressure die castings—removes gas, sulfur and iron.

DIE COATING—For pressure zinc base die castings, —will not scale, blister or create gas in the molds.

PERMANENT MOLD COATING—For aluminum and magnesium castings — adds longer life to molds. Produces clean gas free castings.

POT COATING—For iron pot melting — increases life of pots. Prevents iron pick up.

U. S. Patents No. 2,490,327 and No. 2,500,097

PITTSBURGH METALS PURIFYING COMPANY

World's Largest Manufacturer of Fluxes and Purifiers For All Metals and Alloys

1352 MARVISTA ST., N. S. PITTSBURGH 12, PA.

ACTIVITIES OF FOUNDRY GROUPS

CHICAGO Chapter of the AFS held its annual stag outing on Aug. 27 at Lincolnshire Country Club, Crete Township, Ill. About 800 guests and members attended, some of whom are shown here. Photos by courtesy of Fred Ridenour, Whiting Corp.

Northeastern Ohio

NORTHEASTERN Ohio Chapter of the AFS opened the 1954-55 season with a technical meeting attended by 200 members and guests at Tudor Arms Hotel, Cleveland. Speaker was Lester B. Knight, president, Lester B. Knight & Associates Inc., Chicago.

President David Clark Jr. announced that the October meeting will be designated Ray Fleig Night, in honor of F. Ray Fleig, Smith Facing & Supply Co., who was chapter treasurer for 17 years until his resignation at the end of the 1953-54 season. The October technical session will feature George Riley, American Brake Shoe Co., discussing "Safety in the Foundry."

Mr. Knight's subject was "Modernization of Foundries." He defined modernization as the application and successful use of the organization, methods, facilities and controls that permit maximum production with minimum man-hours and materials consumption and result in an adequate return to labor, management and owners. Foundry problems, Mr. Knight stated, are seldom alike. They vary not only with foundry size and type of product, but also with the people in the industry. As a result, modernization is a new and different problem in almost each foundry.

Cost of mechanization must be justified. It should be amortized in three years, or in five at the outside. A completely new shop should be able to save enough from its mechanization to pay the entire cost of installation in ten years.—*Jack C. Miske.*

Southern California

NEARLY 500 members and guests of the Southern California Chapter of the AFS attended the 17th annual summer picnic and show held at the Lakewood Country Club, Long Beach, Calif., Aug. 14. Golf and a horse shoe tournament highlighted the affair. Music in the afternoon was provided by P. C. "Pat" Valentine and his trio, who have entertained at all 17 picnics. Entertainment chairman was Ray Orr, Howell Foundry Co.

The chapter will meet Oct. 15 at Rodger Young Auditorium, Los Angeles, to hear A. L. Kreuer, sales manager, Orefraction Inc., Pittsburgh, speak on "Zircon Sand".—*W. G. Stenberg, U. S. Electrical Motors Inc.*

GIFS 26th Annual Meeting

GRAY Iron Founders' Society will hold its 26th annual meeting at the Homestead, Hot Springs, Va., Nov. 11-12. The President's reception and dinner will be held Nov. 10. Program of the conference will cover discussion of methods of stimulating business through market research and product study and development. Detailed program follows:

Wednesday, Nov. 10

10:00 a.m.—Meeting, retiring and new board of directors.
6:30 p.m.—Reception.
7:30 p.m.—President's dinner.

Thursday, Nov. 11

9:00 a.m.—Registration.
10:15 a.m.—Business session:
Report of the president—Henry J. Trenkamp, Ohio Foundry Co., Cleveland.
Report of the treasurer—Walter O. Larson, W. O. Larson Foundry Co., Grafton, O.
Report of the executive vice president—Donald H. Workman.
Report of the technical director—Charles F. Walton.
11:15 a.m.—Report of Gray Iron Program Evaluation Committee, C. R. Culling, chairman.
12:30 p.m.—Industry luncheon—Speaker, Wendell B. Barnes, administrator, Small Business Administration, Washington.

(*Continued on page* 217)

Compressor keeps foundry supplied with air— TIMKEN® bearings hold down wear

WHEN compressor parts stay in proper alignment, there's less wear—practically never a breakdown. One way Pennsylvania Pump and Compressor Company insures long-lasting accuracy of related parts is by mounting the crankshaft and belt idler attachments of this compressor on Timken® tapered roller bearings.

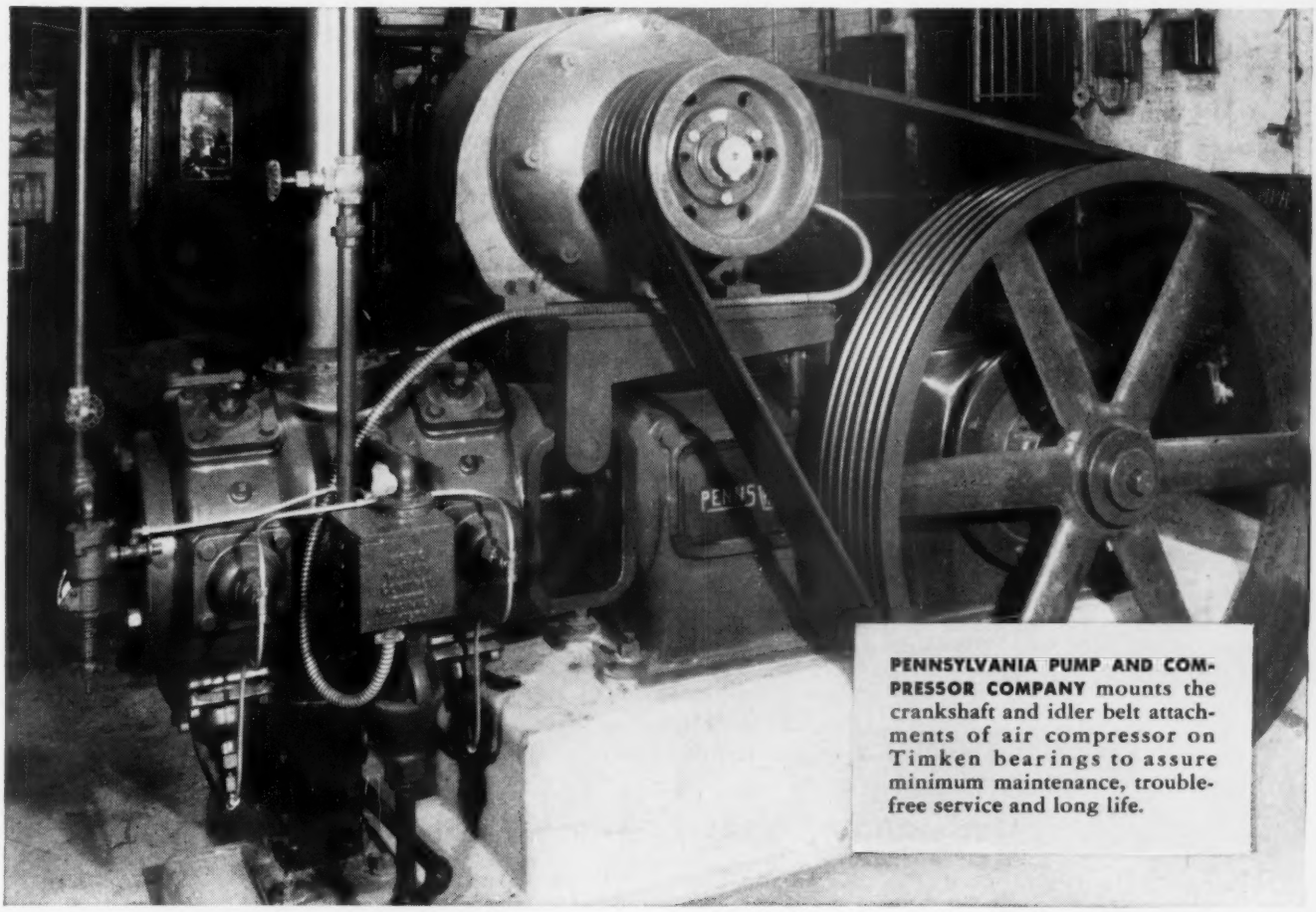
In the crankshaft application, for example, Timken bearings reduce wear by holding the shaft and adjacent parts in positive alignment. That's because the tapered construction of Timken bearings enables them to take any combination of radial and thrust loads.

Timken bearings keep housings and shafts concentric making closures more effective. Result: Dirt, sand and moisture are kept out, lubricant kept in.

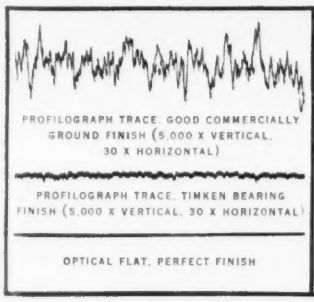
Because Timken bearings are manufactured to extreme precision limits and finished to incredible smoothness, they make friction practically negligible. And you're always assured of Timken bearings' quality because we make our own steel. No other U. S. bearing manufacturer does.

To get these advantages in the equipment you build or buy, always specify Timken bearings. Always look for the trade-mark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



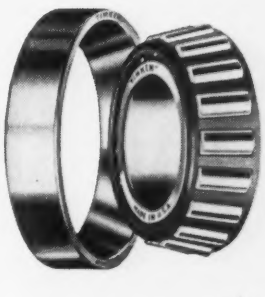
PENNSYLVANIA PUMP AND COMPRESSOR COMPANY mounts the crankshaft and idler belt attachments of air compressor on Timken bearings to assure minimum maintenance, trouble-free service and long life.


PROFILOGRAPH TRACE, GOOD COMMERCIALLY GROUND FINISH (5,000 X VERTICAL, 30 X HORIZONTAL)
PROFILOGRAPH TRACE, TIMKEN BEARING FINISH (5,000 X VERTICAL, 30 X HORIZONTAL)
OPTICAL FLAT, PERFECT FINISH

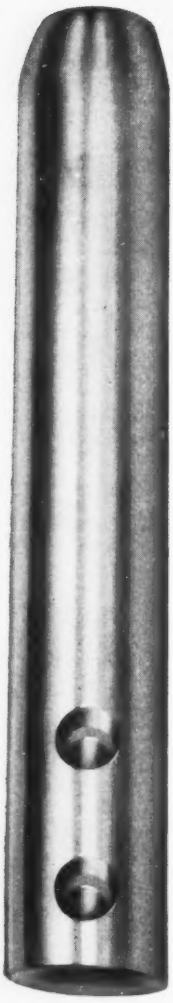
SMOOTH TO MILLIONTHS OF AN INCH

Surface finish of high quality Timken bearing rollers and races is so smooth that it takes a profilograph to measure its smoothness. This instrument measures surface variations to a millionth of an inch, as shown at the left.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

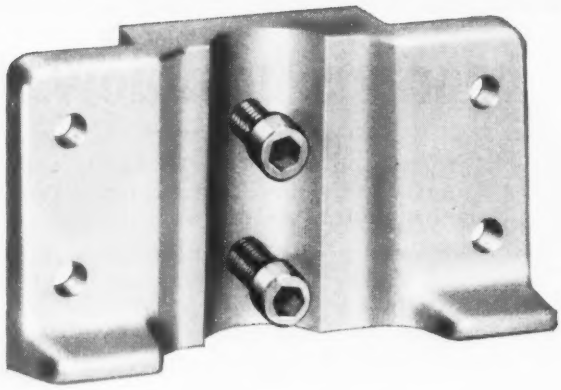


NOT JUST A BALL ◯ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ↓ AND THRUST →◯← LOADS OR ANY COMBINATION



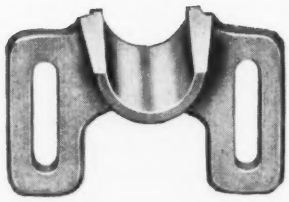
ADAMS 1" ROUND PIN

Side Mounting—Reversible
Countersunk Both Sides
Hardened—Ground
Hard Chrome Plated



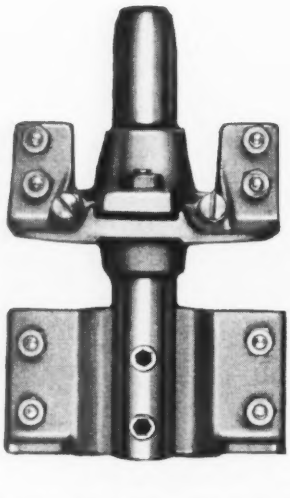
ADAMS 1" ROUND PIN BASE
(Cast Aluminum)

For Side Mounted Reversible Pins
Pins Mounted with Allen
Hollow Head Set Screws



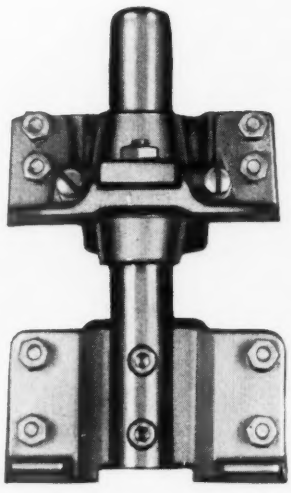
ADAMS MATCH PLATE EAR

Extra Long for
1" diameter Pins
(Side Mounted)



ADAMS 1" ROUND PIN AND EAR
(For Cherry Flasks)

Side Mounting Permits Use of
Extra Long Match Plate Ear Assuring Expert Deep Pattern Draw



ADAMS 1" ROUND PIN AND EAR
(For Aluminum Flasks)

Side Mounting Assures Rigidity
of Pin. Adds Extra Life Because
of Simple Reversible Feature

1883—ADAMS QUALITY AND PRECISION—1954

Adams Quality and Precision remains constant through rigid specifications governing the manufacture of all New Flask Equipment or Flask Trimmings to be used for Part Replacement. Write us today. Your equipment problems can be solved by Adams.

The ADAMS Company

ESTABLISHED 1883

MOLDING MACHINES and FLASK EQUIPMENT

700 FOSTER STREET, DUBUQUE, IOWA, U.S.A.

(*Continued from page* 214)

Presentation of retiring board of directors.

2:00 p.m.—Business session:
Panel discussion on insurance. Subject: **"Product Liability Insurance."** Speaker: James O. Honeywell, assistant secretary, New Amsterdam Casualty Co., Baltimore. Subject: **"Bailee Legal Liability Insurance."** Speaker: George V. Whitford, vice president, Fire Association of Philadelphia. Panel moderator: Peter E. Rentschler, president, Hamilton Foundry & Machine Co., Hamilton, O.

3:00 p.m.—Question and answer period.

7:30 p.m.—Industry banquet.

Friday, Nov. 12

9:00 a.m.—Registration.

10:15 a.m.—Business session:
"Markets Are Where You Find Them." Speaker: N. R. Ladabouche, market research manager, *Steel*. **"Increasing Your Sales Through Product Development."** Speaker: Ross L. Gilmore, president, Superior Steel & Malleable Castings Co., Benton Harbor, Mich. Remarks by Paul W. Vandenberg, chief, Castings Section, Business & Defense Service Administration, Washington.

12:30 p.m.—Industry luncheon.
Introduction of new officers and directors. Presentation of citations and awards. Speaker: Martin R. Gainsbrugh, chief economist, National Industrial Conference Board Inc., New York.

TWIN CITY Chapter of the AFS held its annual golf outing on Aug. 2 at Midland Hills Country Club, St. Paul, Minn. More than 250 members and guests attended. J. S. Garske, Progress Pattern & Foundry Co., right, receives the chapter's golf trophy for the third consecutive year. A. W. Johnson, Northern Malleable Iron Co., chapter chairman, makes the presentation. Photograph by the courtesy of R. J. Mulligan, Foundry Products Division, Archer-Daniels-Midland Co.

Investment Casting Institute

INVESTMENT Casting Institute will hold its Fall meeting in Chicago, Nov. 3-4, at the Congress Hotel. The board of directors, the materials specification committee, and the inspection and standard quality practices committee will meet Nov. 3. Regular meeting will convene Nov. 4 and the program will be devoted primarily to a discussion of technical problems of the industry. Attendance will be limited to members of the institute and guests.

Purdue Casting Conference

SEVENTH annual Purdue Metals Casting Conference will be held Oct. 28-29 at Purdue University, Lafayette, Ind. The conference is sponsored by the Michiana and Central Indiana Chapters of the American Foundrymen's Society in co-operation with Purdue University. V. S. Spears, American Wheelabrator & Equipment Corp., Mishawaka, Ind., is conference chairman. Detailed program follows:

Thursday, Oct. 28

9 a.m.—Conference opens with welcome by F. C. Hockema, vice president and executive dean, Purdue University. Response by M. J. Lefler, plant manager, Oliver Corp., South Bend, Ind., and a national director of AFS. **"Properly Engineered Castings Will Save Your Customers Money,"** by W. G. Ferrell, vice president in charge of manufacturing, Auto Specialties Mfg. Co., St. Joseph, Mich. Chairman, P. F. Chena, Purdue University.

1:30 p.m.—**"Good Pattern Design Is Everybody's Business,"** by Carl Damm, superintendent, Pyle Pattern Mfg. Co., Muskegon Heights, Mich. Chairman, Emil Schmidt, foundry manager, Studebaker Corp., South Bend, Ind.

3 p.m.—**"Cost Savings through Work Simplification,"** by W. C. Cheek, superintendent of standards and methods, Central Foundry Division, General Motors Corp., Danville, Ill. Chairman, H. T. Amrine, Purdue University.

6:30 p.m.—**Banquet.** Speaker, Ivan L. Willis, vice president in charge of industrial relations, International Harvester Co. Toastmaster, J. P. Lentz, assistant works manager, Indianapolis Works, International Harvester Co.

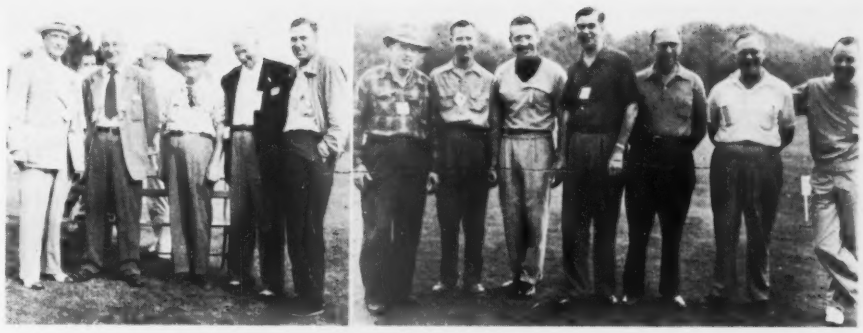
Friday, Oct. 29

10 a.m.—**"Back Slagging and Hot Blast,"** by G. P. Phillips, manager of foundry research, Manufacturing Research Division, International Harvester Co., Chicago. **"Front Slagging and Moisture Control,"** by O. L. Wilhelm, foundry manager, Delco-Remy Division, General Motors Corp., Anderson, Ind. Chairman, William A. Zeunik, chief metallurgist, National Malleable & Steel Castings Co., Indianapolis.

11:15 a.m.—Speaker, W. E. Patterson, vice president, Elkhart Foundry & Machine Co., Elkhart, Ind. Chairman, Roy Payne, president, Sterling Brass, Elkhart.

1:30 p.m.—**"Problems in the Cleaning Room,"** by H. A. Graber, general foreman, cleaning room, Studebaker Corp., South Bend, Ind. Chairman, Franklin Swain, Golden Foundries, Columbus, Ind.

3 p.m.—Closing remarks by V. Spears, American Wheelabrator & Equipment Corp., Mishawaka, Ind., conference chairman; and C. T. Marek, Purdue University.



WESTERN MICHIGAN Chapter of the AFS held its 14th annual stag picnic Aug. 14 at the Pontaluna Golf Club, Muskegon. Above left is the honorary welcoming committee. Left to right: George W. Cannon Sr., M. W. Gregory, George Richardson, Al Jacobson Sr., Horace Deane. At right are current chapter officers: John Powers, Campbell, Wyant & Cannon, secretary; Fred J. DeHudy, Centrifugal Foundry Co., director; J. A. VanHaver, Sealed Power Corp., chairman; Erwin Albrecht, Blackmer Pump Co., director; E. C. Bumke, Campbell, Wyant & Cannon, director; George Tarr, Lakey Foundry Co., director, and G. Bartlett, Newaygo Equipment Co., vice chairman. Photos by courtesy of W. W. Hicks, Sealed Power Corp.

Die Casting Institute

THE Doehler Award, highest prize of the die casting industry, was made to Walter M. Goldhamer, vice-president, Superior Die Casting Co., Cleveland, during the American Die Casting Institute's 26th annual meeting at Chicago, Sept. 15-16. Citing Mr. Goldhamer for conceiving and organizing the Die Casting Research Foundation for metallurgical investigation on metals and processes affecting every branch of American industry, the institute's president, G. M. Rollason, Aluminum Co. of America,

(*Continued on page* 220)

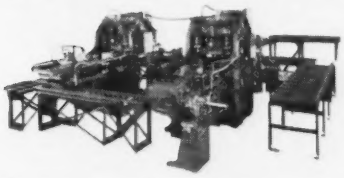
TEXAS Chapter of the AFS met recently to install officers for the 1954-55 season. Newly elected officers are pictured above. Left to right, James R. Hewitt, Hewitt-McGrail Co., Houston, vice chairman, Edward W. Wey, Dee Brass Foundry, Houston, chairman, E. F. Laminack, Texas Steel Co., Ft. Worth, treasurer, and J. D. Magee, Federated Metals Division, American Smelting & Refining Co., Houston, secretary. Photo by W. A. Bearden, M. A. Bell Co.

"WE'VE GOT AHE

"That's right, son, we're competitive with the best of them . . . now that we've got our new SPOMATIC!"

A recent survey showed that many large jobbing and production foundries are being caught in "the middle." They are trying to meet stiffer competitive prices while operating antiquated inefficient equipment. With fully automatic molding machines making even "new" standard equipment obsolete almost overnight, survival will depend more than ever on the ability to produce more for less.

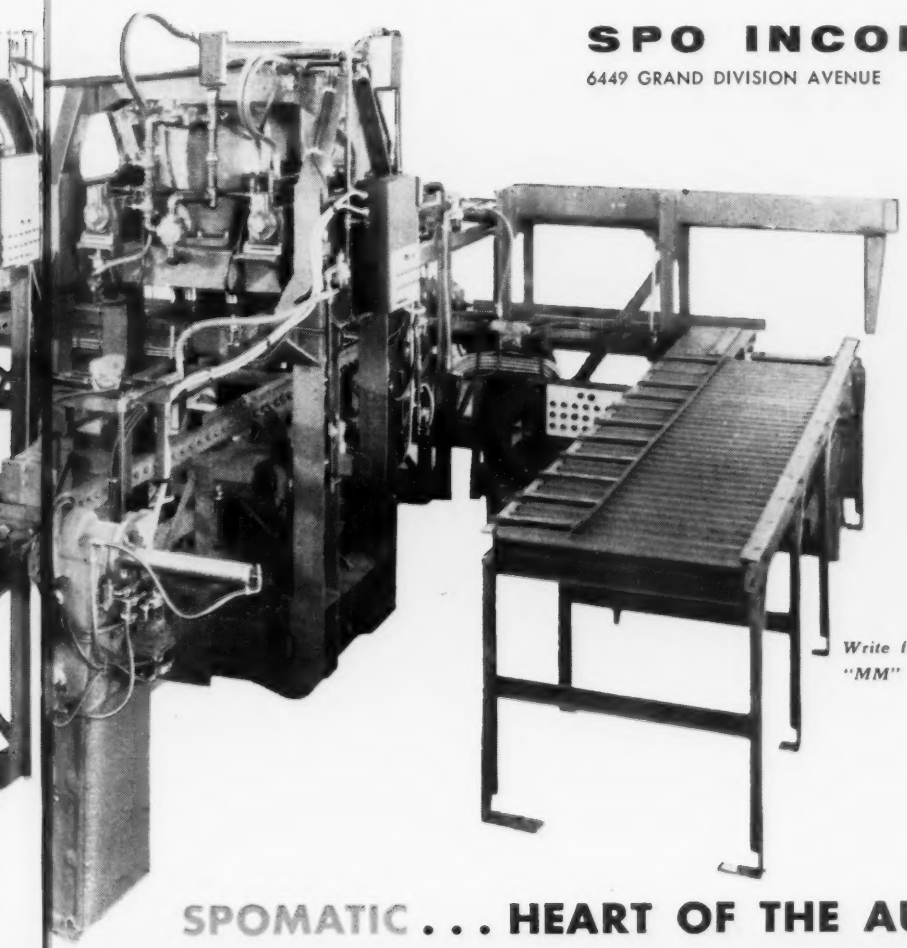
AHEAD START ON TOMORROW . . . TODAY!"



The SPOMATIC provides the most economical, high-speed, efficient means of automatic production molding available today. Operating with minimum supervision and effort, it will outproduce any other molding equipment. The SPOMATIC molds copes and drags simultaneously. Once it is started, all operations are fully automatic, mechanical and continuous.

The SPOMATIC will give you an edge on competition . . . permit tremendous savings that will amortize initial costs quickly . . . and will keep your production jobs profitable.

SPOMATIC installations are engineered to individual foundry requirements. SPO engineers will be glad to discuss your needs . . . to give you a head start on tomorrow today!



SPO INCORPORATED

6449 GRAND DIVISION AVENUE • CLEVELAND 25, OHIO

WORLD'S LARGEST SUPPLIERS SPO OF MOLDING MACHINES

Write for Bulletin "MM" for additional details.

SPOMATIC . . . HEART OF THE AUTOMATIC FOUNDRY

3075-SI

OVER 300 members and guests attended the St. Louis Chapter's annual picnic on Aug. 7 at Maple Grove, St. Louis Co., Mo. Part of the crowd is shown above. Athletic contests, other games, and an abundance of food kept everyone occupied. Local suppliers donated attendance prizes. Entertainment chairman was John O'Meara, Banner Iron Works. Fred Boeneker, chapter chairman, Bronze Alloys Co., welcomed all present and disclaimed responsibility for aching backs and sore muscles. Photo by Jack Bodine Jr., Bodine Pattern & Foundry Co.

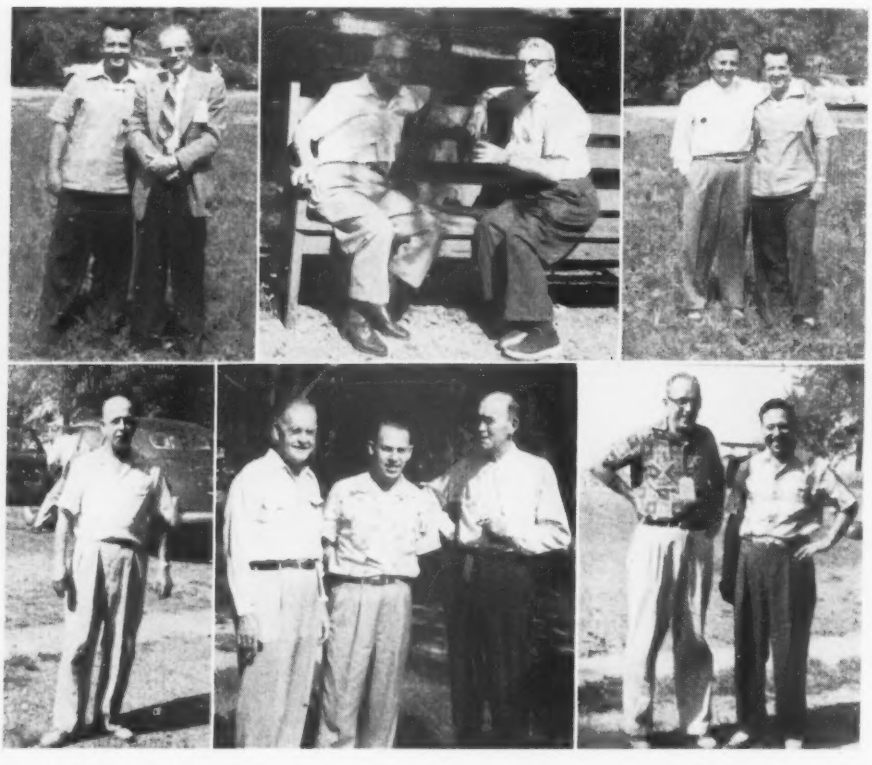
(*Continued from page* 217)
presented the award to Mr. Goldhamer.

During the banquet, the new color film, "Die Casting—How Else Would You Make It!", produced by the American Zinc Institute in cooperation with the ADCI, had its first public showing.

Another part of the institute's program, the Certified Zinc Alloy Plan, was discussed earlier in the day. This plan is a method of licensing zinc die casters who voluntarily permit inspection of their products to insure quality control and maintenance of consumers' specifications.

At one session, a panel discussion on "The Use of Non-Flammable Hydraulic Fluids in Die Casting Machines" was held, with representatives of Carbide & Carbon Chemical Corp., Monsanto Chemical Co., E. F. Houghton & Co., and Celanese Corp. of America, leading producers of such fluids, participating.

A program for developing "Product Standards for Die Castings" was announced at the meeting by institute officials, in line with the institute's policy of maintaining high quality in all die cast products.



WESTERN NEW YORK Chapter of the AFS held its annual summer outing on June 26 at Depew Grove, N. Y. Horseshoe pitching, nail driving, shuffle board, and other types of contests were part of the entertainment program. Several chapter members and guests are shown above. Photographs are through courtesy of J. W. Clifford, Atlas Steel Casting Co.

Northwest Regional Conference

FIFTH annual Northwest Regional Foundry Conference will be held Oct. 15-16, at Vancouver, British Columbia, under the joint sponsorship of the Oregon, Washington, British Columbia, and Oregon State Student Chapters of the American Foundrymen's Society, in cooperation with the University of British Columbia.

It is planned to have sessions on steel, iron, brass, and light alloys in addition to the regular banquet and luncheon. A ladies program also is planned.

Scheduled speakers include: T. R. Stanley, Consolidated Mining & Smelting Co., Trail, B. C.; J. E. Rehder, Canadian Iron Foundries, Montreal, Que.; A. E. Cartwright, Crane Ltd., Montreal, Que., and P. H. Hookings, Major Aluminum Products Ltd., Vancouver. The program will close with a dance at Stanley Park sports pavilion on Saturday evening.

New England Conference

FOURTEENTH New England Regional Foundry Conference will be held at Massachusetts Institute of Technology, Oct. 29-30. As in previous years, the meeting is sponsored by the New England Foundrymen's Association and MIT in cooperation with ten other technical groups of the area.

Technical program of the conference includes two days of two simultaneously held sessions. One series will be devoted to ferrous subjects, the other to nonferrous foundry practice. The annual conference dinner will be held Friday evening, while local representatives of foundry supply companies are sponsoring a post-conference dinner Saturday evening.

Joseph B. Stazinski, General Electric Co., Everett, Mass., is chairman of the committee on conference arrangements.

The program follows:

Friday, Oct. 29

9 a.m.—**Registration.**

10 a.m.—**Address of Welcome,** by C. Richard Soderberg, dean of engineering, MIT. Chairman, Joseph B. Stazinski, General Electric Co., Everett, Mass.

10:15 a.m.—**Ferrous Session:** "Evaluation of the Shell, 'D' and Pressure Molding Processes," by George Jackson, Walworth Co., Boston; Harry W. Dietert, Harry W. Dietert Co., Detroit; Thomas E. Barlow, Eastern Clay Products Department, International Minerals & Chemical Corp., Chicago. Chairman, Robert C. Walker, Whitin Machine Works, Whitinsville, Mass.; co-chairman, Kenneth McGrath, Hunt-Spiller Mfg. Corp., South Boston, Mass.

(*Concluded on page* 222)

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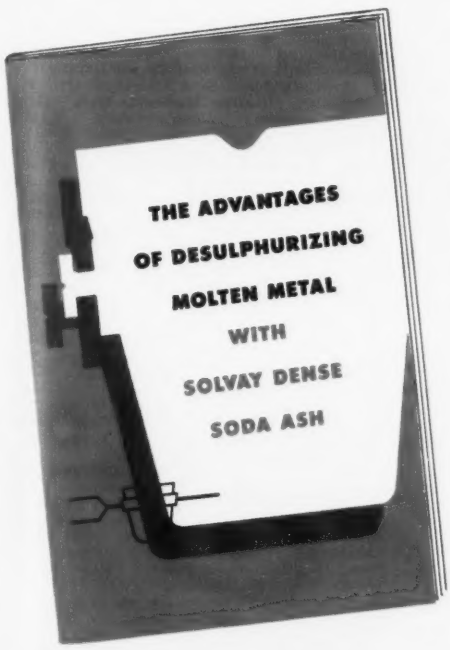

Further Information Contained in Valuable Book—Available on Request

"The Advantages of Desulphurizing Molten Metal with Solvay Dense Soda Ash" has been published by Solvay for the benefit of the foundryman. It contains important information on the advantages you can gain by desulphurizing with Solvay Dense Soda Ash. It also explains what type of equipment is needed and how to obtain it. This book is available free—on request—by simply writing to Dept. AT-10. Be sure to get your copy.

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PHILADELPHIA Chapter of the AFS held its annual outing and picnic in July at the Manufacturers Country Club, Oreland, Philadelphia, with approximately 570 members and guests attending, some of whom are shown above. A golf tournament, softball game, floor show and other activity highlighted the program. Photographs by Leo Houser, Dodge Steel Co.

(*Concluded from page* 220)

10:30 a.m.—**Nonferrous Session:** "Brass and Bronze Foundry Practice for Pressure Castings," by William Romanoff, H. Kramer & Co., Chicago. Chairman, William Stone, Guilford, Conn.; co-chairman, Stafford W. Chappell Jr., General Dynamics Corp., Groton, Conn.

12 noon—Lunch.

1:30 p.m.—**Ferrous and Nonferrous Session:** "A Foundry Disease—Casting Defects?" by Clyde A. Sanders, American Colloid Co., Chicago. Chairman, N. Paul Benson, Pioneer Foundry & Mfg. Co., Gilbertville, Mass.; co-chairman, D. Wesley Case, Detroit Control Corp., Belknap Mfg. Co., Bridgeport, Conn.

3 p.m.—**Ferrous Session:** "Materials Handling," by Lester B. Knight, Lester B. Knight & Associates Inc., Chicago. Chairman, James T. Robinson, United Shoe Machinery Corp., Beverly, Mass.; co-chairman, Roy E. Hayward; Draper Corp., Hopedale, Mass.

Nonferrous Session: "Practical Aspects of Aluminum and Aluminum Alloys," by Charles Batchelder, Charles Batchelder Co. Inc., Botsford, Conn. Chairman, Louis Penkoff, Peerless Aluminum Foundry, Bridgeport, Conn.; co-chairman, Owen Johnson, H. B. Ives Co., New Haven, Conn.

6:30 p.m.—**Conference Dinner.** Speaker, Gerry Moore, *Boston Post*, Boston. (courtesy Mystic Iron Works and New England Coke Co.) Chairman, Prof. Howard F. Taylor, MIT; co-chairman, Thomas I. Curtin Jr., Waltham Foundry Co., Waltham, Mass.

Saturday, Oct. 30

8 a.m.—**Registration.**

9 a.m.—**"Total Power"**—Human Relations Subject, by Kenneth G. Yost, National Metal Trades Association, Chicago. Chairman, Frank A. Benoit Jr., Brown & Sharpe Mfg. Co., Providence, R. I.; co-chairman, Harry K. Sleicher, Seaboard Foundry Inc., Providence.

10:30 a.m.—**Ferrous Session:** "Reducing Cleaning Costs in Jobbing Foundry," by C. W. Mooney Jr., Olney Foundry, Link-Belt Co., Philadelphia. Chairman, Joseph T. Burke, Lowell Iron Foundry Inc., Lowell, Mass.; co-chairman, Samuel E. Camack, General Electric Co., Lynn, Mass.

Nonferrous Session: "Plaster Molding," by Robert Megaw, U. S. Gypsum Co., Chicago. Chairman, Julius Ferrari, Gorham Mfg. Co., Providence, R. I.; co-chairman, Walter Carlson, Carlson Pattern Works, Springfield, Mass.

12 noon—**Lunch.**

1:30 p.m.—**Ferrous Session:** "Cupola Practice," by Walter R. Jaeschke, Whiting Corp., Harvey, Ill. Chairman, William Keown, Warren Foundry & Pipe Corp., Everett, Mass.; co-chairman, R. J. Lemoine, Fitchburg Foundry Inc., Fitchburg, Mass.

Nonferrous Session: "Melting Practice," by Robert A. Colton, Federated Metals Division, American Smelting & Refining Co., Newark, N. J. Chairman, Arthur Dwyer, Hingham Foundry, Hingham, Mass.; co-chairman, Ralph Tierney, Exeter Brass Division, Bridgeport Brass Co., Exeter, N. H.

3 p.m.—**Ferrous Session:** "Casting Clinic." Panel members: James S. Stringfellow, Draper Corp., Hopedale, Mass.; Nick Nesbitt, Grinnell Corp., Providence, R. I.; Lloyd E. Matteson Jr., Narragansett Gray Iron Foundry Co., Providence. Chairman, William Hale, Springfield Foundry Co., Indian Orchard, Mass.; co-chairman, William O'Dell, L. F. Fales Machine Co., Walpole, Mass.

Nonferrous Session: "Casting Clinic." Panel members: Fran Wolfer, American Hardware Co., New Britain, Conn.; Robert Sheldon, Springfield Bronze & Aluminum Co., Springfield, Mass.; Dan Sutherlan, Somerville Machine & Foundry Co., Somerville, Mass.; Eli Portman, Stillman-White Foundry, Providence, R. I. Chairman, Frank Tibbetts, Wollaston Brass & Aluminum Foundry, Wollaston, Mass.; co-chairman, Kneeland McIlvin, Bethlehem Shipbuilding Corp., Quincy, Mass.

5 p.m.—**Conference Adjournment.**

Michigan Regional Conference

A PROGRAM which includes a look into the future as well as discussions of recent research and development projects is planned for the Michigan Regional Foundry Conference. Sessions will be held at the University of Michigan, Ann Arbor, Mich., on Oct. 14-15. Program details follow:

Thursday, Oct. 14

8:30-8:45 a.m.—Registration, Rackham Hall

9:30-9:45 a.m.—Prof. R. A. Flinn, University of Michigan, introduces co-chairmen G. G. Brown and C. C. Sigerfoos, University of Michigan. Mr. Brown opens conference with a brief welcome. H. Laforet presides over morning sessions.

9:45-10:30 a.m. — **"Casting Horizons,"** William G. Gude, managing editor, FOUNDRY.

11:00 a.m.-12:30 p.m.—**"Risering Steel,"** J. B. Caine, consultant, Cincinnati. **"Risering Gray Iron,"** William Culling, Carondolet Foundry, St. Louis.

12:30-1:45 p.m.—Luncheon. **"The Future of Castings in the Automobile Industry,"** James F. Smith, Central Foundry Division, General Motors Corp.

2:00-5:00 p.m.—**"Gating Gray and Ductile Iron,"** Carl B. Stone, Lynchburg Foundry Co., Lynchburg, Va. **"Gating Aluminum,"** Harry Hillstrom, chief metallurgist, Aluminum Co. of America, Cleveland. **"Gating Magnesium,"** H. E. Elliott, assistant foundry superintendent, Dow Chemical Co., Bay City, Mich. **"Gating Malleable Iron,"** C. C. Lawson, general superintendent, Wagner Malleable Iron Co., Decatur, Ill.

6:00 p.m.—Dinner. Speaker, Fred J. Walls, International Nickel Co., Detroit, **"Quality and Economy in the Foundry through Engineering."** Toastmaster, Harry Kessler, Sorbo-Mat Process, St. Louis. Entertainment.

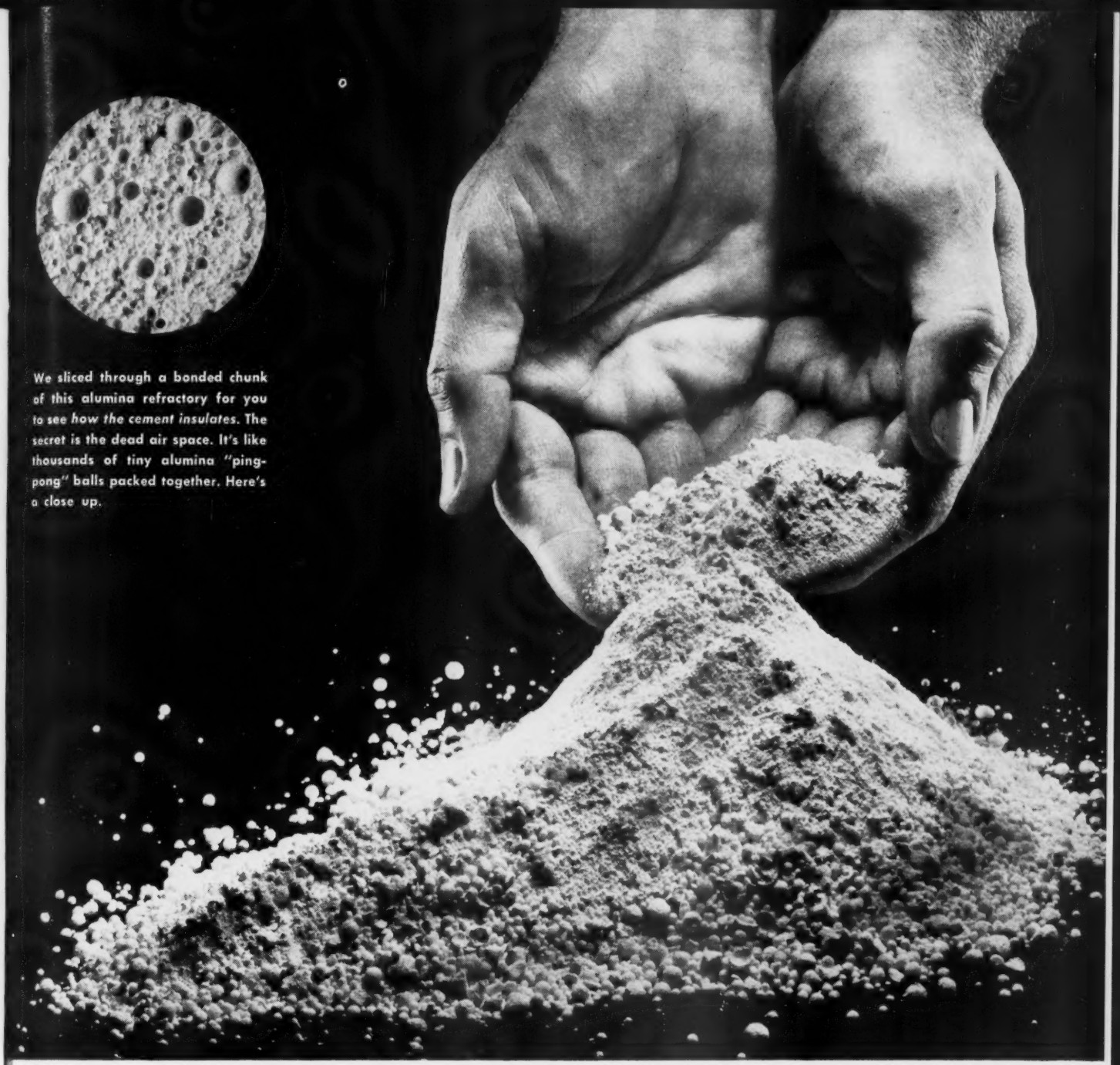
Friday, Oct. 15

9:00-12:00 a.m.—**"Green Sand Pressure Molding,"** John VanHaver, Sealed Power Corp., Muskegon, Mich. **"Shell Mold Production,"** Harold Sieggreen, Saginaw Malleable Plant, General Foundry Division, General Motors Corp. **"Permanent Mold Production,"** Howard McClelland, Eaton Mfg. Co., Vassar, Mich.

12:00-1:30 p.m.—Luncheon. Demonstrations in Experimental Foundry and Cast Metals Laboratory, East Engineering Bldg.

1:30-2:30 p.m.—Review of Cast Metal Research, University of Michigan; discussion leader R. A. Flinn. **"The Microbend Test—A New Tool for Evaluating Cast Metal Structure,"** P. K. Trojan. **"Dimensional Accuracy and Surface Quality in Shell Molded Castings,"** Floyd R. Smith. **"Graphitization in Magnesium-Treated Ferrous Materials,"** C. R. Hammond.

2:30-3:00 p.m.—**"Careers in the Casting Industry,"** E. J. Walsh, executive secretary, Foundry Educational Foundation.



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And when set, these cements stand from 2800 to 3100 F, depending on the type used. Even at these extreme temperatures, they show little or no shrinkage. And since they are made of one of the most stable and inert materials in existence, they are inherently resistant to practically all furnace conditions. They are unaffected by furnace atmospheres . . . combustion gases . . . etc.

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OBITUARY

ERNEST LANCASHIRE, manager of foundry sales, Union Metal Mfg. Co., Canton, O., died Aug. 30. Mr. Lancashire received his metallurgical training in England at Sheffield University, and in 1923 became associated with the Granite City, Ill. and Alliance, O., plants of American Steel Foundries. Later connections included Standard Brake Shoe & Foundry Co., Pine Bluff, Ark., West Michigan Steel Foundry Co., Muskegon, Mich., Detroit Steel Casting Corp., Detroit, and Clark Casting Corp., Canton, O.

* * *

Percy H. Wilson, 69, since 1943 deputy managing director, Stanton Ironworks Co. Ltd., Nottingham, England, died July 25. Before joining the company in 1919 as general manager he was associated with the Alfreton Works, James Oakes & Co., and Staveley Coal & Iron Co. Ltd., near Chesterfield. President of the Institute of British Foundrymen in 1947, in 1942 he received the E. J. Fox medal of that society in recognition of his work in production and development of centrifugally cast iron pipe. He was president of the British Cast Iron Research Association in 1948-50.

* * *

James Mitchell, 71, former president, Cleveland Co-operative Stove Co., Cleveland, died Aug. 20. Mr. Mitchell retired two years ago after 52 years in the stove and foundry industry.

* * *

Charles E. Andrews, 83, formerly director and New England manager, Whitehead Brothers Co., New York, died recently. He retired in 1946 after 42 years with the Whitehead Co.

* * *

James D. Magirl, president, Magirl Foundry & Furnace Co., Bloomington, Ill., died Aug. 26.

* * *

Daniel Coonan Eagan, 71, cost analyst, Dodge Steel Co., Philadelphia, died Aug. 29.

* * *

F. Lloyd Woodside, 58, president, Park Chemical Co., Dertoit, died Aug. 9.

* * *

Edward W. Beach, 80, foundry engineering executive, died in June. Mr. Beach entered his apprenticeship in 1891, at Waterbury Farrel Foundry & Machine Co., Waterbury, Conn., and until his retirement in 1950 was successively president,

Manufacturers Foundry Co.; president, Ferro Machine & Foundry Co., Cleveland; vice president, Warren Foundry Co., Warren, O.; and engineering executive, Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich. A charter member of the Western Michigan Chapter of the AFS, he became a director of the national organization, and in 1951 was awarded an AFS honorary life membership for outstanding contributions in the field of foundry engineering.

Publishes Booklet on Steel Foundries

Keokuk Steel Casting Co., Keokuk, Iowa, and Mid-Continent Steel Casting Corp., 1461 West 59th St., Shreveport, La., have published a 32-page booklet describing their operations. Large illustrations are used to describe the plant facilities and the types of products manufactured. Three pages of specifications give the mechanical and chemical properties of the different grades of steel poured. A section on design is followed by illustrated examples of product development showing how steel castings improve on previous designs. Photographs of the management and history of firm complete the brochure.

Book Review

Titanium and Titanium Alloys by John L. Everhart, cloth, 4¼ x 6½-in., published by Reinhold Publishing Corp., 330 West 42nd St., New York. Price $3.

Pocket-size book is intended for the designer or engineer interested in the possibilities of applying titanium in the solution of engineering problems. Only sufficient information is included on production to indicate the effects of melting methods on the properties. The book will not appeal particularly to those interested in research and development, for it deals almost exclusively with technology. The properties of pure titanium are covered briefly to furnish a background for a discussion of commercial materials. The author hopes that the book will indicate the present state of knowledge of titanium technology and point to some of the directions in which progress can be expected.

By chapters the text covers high purity titanium, properties of commercial titanium and its alloys, heat treatment, forming and fabricating, joining, machining and grinding, cleaning and finishing, and applications.

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The thousands of flat tempered steel wires in the brush revolving at high speed pick up small particles of used sand, added bond and moisture and blend them thoroughly. This process is so thorough that either clay bond or new moulding sand is blended with the heap successfully and a minimum of moisture is required. A portable screen and water dispenser are valuable added features.

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Dallas City, Illinois

Tentative Specifications for Ferromanganese

Tentative Specifications for

Ferromanganese

ASTM Designation: A 99—53T

Issued, 1953

Scope

1. These specifications cover seven grades of ferromanganese, designated:

Standard ferromanganese	Grade A, Grade B
Medium-carbon ferromanganese	Grade A, Grade B, Grade C
Low-carbon ferromanganese	Grade A, Grade B

Basis of Purchase

2. (a) Ferromanganese shall be furnished in pigs, or lumps, or crushed or screened to size, as specified.

(b) The reported percentage of managanese as obtained by chemical analysis shall be used to determine the billing of the material to the purchaser.

Chemical Composition

3. (a) The material shall conform to the requirements as to chemical composition prescribed in Table I.

(b) The manufacturer shall furnish an analysis of each shipment showing the manganese content and, when required, such of the other elements specified in Paragraph (a).

Packing

4. Ferromanganese shall be packed in sound containers, or shipped in bulk, in such manner that none of the metal is lost in shipment.

Inspection

5. (a) The inspector representing the purchaser shall have free entry, at all times while work on the contract of the purchaser is being performed, to all parts of the manufacturer's works which concern the sampling, packing, and shipping of the material ordered. The manufacturer shall afford the inspector all reasonable facilities, without charge, to satisfy him that the material is being furnished in accordance with these specifications.

(b) If the purchaser so elects, the material may be sampled by him at the destination, in which case at least 10 per cent of the shipment shall be sampled.

Rejection

6. Any claims or rejections based on check analysis shall be made to the manufacturer within 30 days from the receipt of material by the purchaser.

Sampling

7. The material shall be sampled in accordance with the Standard Methods of Sampling Ferro-Alloys (ASTM Designation: E 32).

Table I—Chemical Requirements[a]

	Standard Ferromanganese		Medium-carbon Ferromanganese			Low-carbon Ferromanganese	
	Grade A	Grade B	Grade A	Grade B	Grade C	Grade A	Grade B
Manganese, per cent[b]	78.0 to 82.0	74.0 to 78.0	80.0 to 85.0	80.0 to 85.0	80.0 to 85.0	80.0 to 85.0	80.0 to 85.0
Carbon, max., per cent	7.5	7.5	as specified[c]	as specified[c]	as specified[c]	as specified[d]	0.75
Phosphorus, max., per cent	0.35	0.35	0.35	0.35	0.35	0.35	0.35
Sulphur, max., per cent	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Silicon, max., per cent	1.2	1.2	1.2	2.5	1.2	1.2	7.0

[a] For purposes of determining conformance with these specifications, the reported analysis shall be round d off to the nearest unit in the last right-hand place of figures used in expressing the limiting value, in accordance with the rounding-off method of the Recommended Practices for Designating Significant Places in Specified Limiting Values (ASMT Designation: E 29).

[b] For purposes of determining the manganese content of any shipment, manganese shall be reported to the nearest 0.01 per cent, applying the same rounding off procedure as prescribed in Footnote a.

[c] Medium-carbon material may be obtained with the following maximum percentages of carbon: 3.0, 2.0, 1.5, and 1.0.

[d] Grade A low-carbon material may be obtained with the following maximum percentages of carbon: 0.75, 0.50, 0.30, 0.15, and 0.10.

Chemical Analysis

8. The chemical analysis of the material shall be made in accordance with the procedure for ferromanganese as described in the Standard Methods of Chemical Analysis of Ferro-Alloys (ASTM Designation: E 31).

Additional copies of this specification may be obtained from the American Society for Testing Materials, 1916 Race St., Philadelphia 3, for a nominal sum.

Proposed Tentative Method of Rapid Indentation Hardness Testing of Metallic Materials

ASTM Designation: E—54T

Issued, 1954

Scope

1. This method covers the procedure for making rapid indentation hardness tests of metallic materials.

NOTE—This test is used when it is desired to make hardness tests very rapidly, as in the inspection of the output of a heat-treating furnace, when precise hardness values are not required This method is not to be regarded as a standard Brinell hardness test method.

Outline of Method

2. The rapid hardness test is one in which a specified load is applied to the surface of the material to be tested through a hard ball of specified diameter, and a measurement of the impression is made, either while the load is being applied or after it is removed, to determine whether the material falls within certain specified limits.

Apparatus

3. (a) Testing Machine—Equipment for rapid hardness testing consists of a testing machine which supports the specimen to be tested, and applies a predetermined indenting load to a ball in contact with the specimen. The magnitude of the indenting load is often limited to certain discrete values. The design and construction of the testing machine shall be such that no rotational or lateral movement of the indenter or test specimen occurs during the test.

(b) Indenting Ball—The standard ball shall be 10 mm (0.3937 in.) in diameter, with a deviation from this value of not more than 0.01 mm (0.0004 in.) in any diameter Other sizes of balls may be used, as provided in Section 5(a). They should be of the specified size within corresponding limits. Any ball to be suitable for use shall withstand pressure against the hardest material to be tested without showing a permanent change in diameter greater than 0.01 mm.

(c) Mechanism for Measuring Size of Impression—If the size of impression is to be determined from measurement of its diameter, the micrometer microscope or other measuring device used shall be such as to permit the direct measurement of the diameter to 0.1 mm and the estimation of the diameter to 0.02 mm. If the size of the impression is to be indicated by depth, a suitable depth-measuring device shall be provided.

Test Specimens

4. (a) The specimens on which rapid hardness tests are to be made will vary greatly in form, since tests are usually made on finished or semifinished parts.

(b) When necessary, the surface on which the impression is to be made shall be filed, ground, machined, or polished with abrasive material so that the edge of the impression shall be defined clearly enough to permit the measurement of the diameter within 0.05 mm. Care should be taken to avoid overheating or cold-working the surface.

Procedure

5. (a) Magnitude of Test Load—It is recommended that loads of 3000, 1500 and 500 kg be used, depending upon the hardness of the material being tested. It is desirable that the test load be of such magnitude that the diameter of the impression is in the range of 25.0 to 47.5 per cent of the ball diameter. The following table gives the preferred test loads and approximate Brinell numbers for this range of impression diameters:

Test Loads, kg	Brinell Hardness Number
3000	160 to 600
1500	80 to 300
500	26 to 100

These loads, which are those recommended for use in making standard Brinell hardness tests, are not mandatory, however, for use in making rapid hardness tests. For certain sizes and conditions of test specimens, it may be desirable to use different loads and indenting balls with diameter smaller or larger than 10 mm. When balls with diameters other than 10 mm are used, it is recommended that the following relationships be maintained between the diameter of the ball, D, measured in millimeters, and the applied load, P, measured in kilograms:

For material of BHN 160 to 600	$P = 30D^2$
For material of BHN 80 to 300	$P = 15D^2$
For material of BHN 26 to 100	$P = 5D^2$

(b) Application of Test Load—The load shall be applied smoothly to the test specimen.

(c) Measurement of Impression—Diameters of impressions may be measured by means of direct-reading microscopes, micrometer microscopes, or by other suitable measuring devices that are capable of measuring the diameters to 0.02 mm. Depth-measuring devices, in which dial indicators are usually incorporated, also may be used for determining the sizes of the impressions. These devices are often equipped with maximum and minimum pointers that make it possible to determine quickly whether or not the readings are within certain limits.

Determination of Hardness Limits

6. In order to establish the limits (either a minimum and a maximum, or only one or the other) of acceptable hardness for a given part or piece, test specimens representing the extremes of acceptability shall be tested in the specific rapid hardness tester that is to be used, and the readings obtained shall be considered the limits of acceptability.

Calibration of Apparatus

7. Rapid hardness testers shall be considered satisfactory for use provided it can be demonstrated that they indicate the same values within ± 0.1-mm of the diameter-measuring scale or ± 0.02-mm of the depth-measuring scale for repeated tests of the acceptability samples bing used.

NOTE—Various types of depth-measuring devices are employed. For a dial indicator having one division equal to 0.0001-in., a difference in depth of 0.02-mm is represented by approximately eight divisions on the dial.

TR

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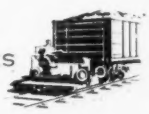
TRACKMOBILES 

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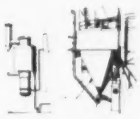
EVAPORATORS AND SPRAY DRYERS 

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NEWS VIEWS

SEAL OF QUALITY: Sinclair Weeks, left, U. S. Secretary of Commerce, accepts enlargement of "C. I." seal of quality from H. E. Robertson, executive vice president, Cast Iron Soil Pipe Institute. A. S. Best, center, project manager, Department of Commerce, looks on. Seal symbolizes new soil pipe standards, which are expected to result in lower building costs and better plumbing quality. Presentation, above, honored the government's help in establishing the standards, originally developed by the institute and branches of the building industry

SAFETY FIRST: On behalf of employees of Union Carbide & Carbon Corp., Morse G. Dial, UCC's president, left, is shown accepting the award of honor for accomplishment in safety during 1953 from the National Safety Council's president, Ned Dearborn. Award is made for improvement in frequency and severity rates below the par rates established by the council. During 1953, accident frequency rate for UCC employees was 3.6 disabling injuries per million man-hours worked. This rate was 73 per cent below the similar rate for all U. S. industry

TRIBUTE: Thomas W. Pangborn (right), founder and president, and John C. Pangborn, first vice president, Pangborn Corp., view the bronze plaque tribute from the more than 1000 employees of the company. The plaque was unveiled at the Hagerstown, Md., plant on Sept. 1 in a ceremony commemorating Pangborn's golden anniversary

OPEN HOUSE: Fischer Casting Co., recently held an open house to mark the opening of its new plant in Middlesex, N. J. Over 1000 employees and members of their families attended the event. Tours were conducted showing various processes by which a casting is developed from blueprint to jet bomber part. The new, modernized, 40,000 sq ft nonferrous foundry is entirely mechanized, with heat treat equipment and a metallurgical laboratory

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Various parts for these Caterpillar-built D8 tractors are peened and cleaned by 20th Century metallic abrasives.

FOUNDRY STATISTICS

MALLEABLE IRON

(Shipments of castings—net tons[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1952	926,120	573,472	.....
1953			
June	86,514	50,819	151,016
6 mo.	532,732	318,847	.....
July	77,111	45,413	137,251
Aug.	73,855	45,415	120,801
Sept.	74,333	45,466	114,523
Oct.	73,473	45,515	104,046
Nov.	63,435	37,500	93,156
Dec.	72,126	39,657	95,612
Total	967,065	577,813	.....
1954			
Jan.	70,288	38,266	85,565
Feb.	69,078	37,792	81,579
Mar.	84,342	47,125	74,219
Apr.	74,515	39,102	69,094
May	67,856	37,306	67,040
June	72,820	41,121	60,163
6 mo.	428,899	240,712	.....

ALUMINUM

(Shipments of castings—1000 pounds)

	Shipments—Total	Sand	Perm. Mold	Die	Unfilled Orders[2]
1952	518,979	194,616	146,883	169,732	.....
1953					
June	56,492	19,349	15,528	21,335	135,486
6 mo.	345,410	115,568	101,559	126,547	.....
July	51,196	16,614	15,692	18,549	125,330
Aug.	50,428	15,940	16,252	17,837	126,781
Sept.	53,306	17,826	17,189	17,875	120,828
Oct.	55,097	17,171	17,030	20,547	115,189
Nov.	51,014	16,169	15,396	19,012	106,977
Dec.	51,571	15,265	16,907	18,963	105,980
Total	658,022	214,553	200,025	239,330	.....
1954					
Jan.	51,446	14,698	16,615	19,709	103,318
Feb.	51,213	14,696	17,281	18,754	96,011
Mar.	56,184	14,468	19,576	21,645	93,407
Apr.	53,006	14,073	18,091	20,366	91,853
May	47,663	12,461	16,312	18,368	83,848
June	48,061	12,442	17,105	17,886	79,126
6 mo.	307,573	82,838	104,980	116,728	.....

COPPER-BASE ALLOY

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Sand	Perm. Mold	Unfilled Orders[2]
1952	1,009,910	910,862	63,865	.....
1953				
June	83,947	75,625	4,705	62,843
6 mo.	526,936	474,317	31,292	.....
July	69,957	63,365	3,927	60,381
Aug.	77,652	69,852	4,890	61,646
Sept.	79,595	71,184	5,273	57,209
Oct.	83,899	74,460	5,775	51,723
Nov.	74,782	66,370	5,077	48,842
Dec.	77,675	68,821	5,082	48,421
Total	990,496	888,369	61,316	.....
1954				
Jan.	71,437	63,034	4,618	42,351
Feb.	68,849	60,913	4,743	21,943
Mar.	76,480	67,952	5,123	38,417
Apr.	72,900	65,418	4,732	34,111
May	67,859	61,469	3,755	31,568
June	70,777	64,328	3,567	30,743
6 mo.	428,302	383,114	26,583	.....

MAGNESIUM

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1952	34,857	32,977	.....
1953			
June	3,063	2,679	13,756
6 mo.	18,889	17,303	.....
July	2,287	2,079	13,927
Aug.	2,490	2,281	13,202
Sept.	2,455	2,238	12,528
Oct.	3,024	2,717	11,473
Nov.	2,681	2,417	10,612
Dec.	2,691	2,434	9,313
Total	34,517	31,469	.....
1954			
Jan.	2,451	2,149	8,800
Feb.	2,194	1,945	8,315
Mar.	2,407	2,109	7,698
Apr.	2,068	1,857	7,358
May	1,738	1,541	7,522
June	2,034	1,820	8,296
6 mo.	12,892	11,421	.....

PRODUCTION WORKERS

Estimated Number

(Thousands)

	May 1954	Apr. 1954	May 1953
Ferrous	190,900	194,200	227,300
Nonferrous	57,400	60,000	76,800

Average Weekly Earnings

Gray Iron	$71.98	$72.56	$75.81
Malleable Iron	72.01	72.58	79.23
Steel	73.66	73.68	79.58
Nonferrous	79.79	78.01	80.34

Average Weekly Hours

Gray Iron	38.7	38.8	41.2
Malleable Iron	37.7	37.8	41.7
Steel	37.2	37.4	40.6
Nonferrous	39.5	39.2	41.2

Labor Turnover Rate (May)

(Per 100 employees)

	Total Accession	Total Separation	Quit	Layoff
Gray Iron	3.2	3.8	0.7	2.6
Malleable Iron	1.9	2.5	0.9	1.2
Steel	1.9	4.1	0.6	3.0
Nonferrous	2.6	4.9	0.8	3.4

Source: Bureau of Labor Statistics

GRAY IRON CASTINGS—SHIPMENTS

(Net tons[1])

	All Castings—Total	All Castings—For Sale	Miscellaneous Castings—Total	Miscellaneous Castings—For Sale	Heavy Steel Ingot Molds—Total	Heavy Steel Ingot Molds—For Sale	Chilled Railroad Car Wheels—Total	Pressure Pipe & Fittings—Total[3]	Soil Pipe & Fittings—Total[4]	Unfilled Orders[2]
1952	12,862,494	7,373,757	8,095,299	3,794,164	2,238,309	1,070,252	544,896	1,312,518	651,472	.....
1953										
June	1,196,106	648,400	743,737	312,681	232,596	115,946	45,542	114,118	60,113	1,245,904
6 mo.	7,221,023	3,877,300	4,530,388	1,936,406	1,448,659	698,918	266,011	649,326	336,639	.....
July	1,056,422	573,280	652,371	274,890	212,187	106,526	36,715	97,739	57,410	1,232,651
Aug.	1,069,392	588,543	646,902	286,449	217,930	107,428	40,327	107,805	56,428	1,222,612
Sept.	1,105,582	611,905	669,225	289,909	232,055	117,694	37,055	108,270	58,977	1,170,191
Oct.	1,141,526	650,229	669,757	300,249	245,966	124,177	41,917	118,306	65,580	1,075,538
Nov.	1,004,326	563,930	589,657	266,039	227,800	111,022	31,373	101,576	53,920	977,012
Dec.	1,032,444	552,565	634,250	274,203	228,532	108,700	30,051	94,053	45,558	954,885
Total	13,630,715	7,417,752	8,392,550	3,537,645	2,813,129	1,374,465	473,449	1,277,075	674,512	.....
1954										
Jan.	932,298	488,497	607,755	261,164	154,359	60,947	31,316	90,898	47,970	871,918
Feb.	936,364	491,983	607,085	252,591	156,933	70,261	29,240	92,546	50,560	865,344
Mar.	1,046,779	553,358	684,272	282,328	153,366	65,950	34,240	113,016	61,895	842,499
Apr.	995,052	528,027	657,126	263,147	126,083	56,114	29,075	116,420	66,348	826,491
May	943,335	516,475	605,385	247,623	122,839	57,106	27,144	122,514	65,453	775,278
June	986,810	556,047	616,317	261,133	141,712	70,060	30,883	130,503	67,395	803,570
6 mo.	5,840,638	3,134,587	3,777,940	1,567,986	855,292	380,438	181,898	665,897	359,621	.....

STEEL CASTINGS—SHIPMENTS

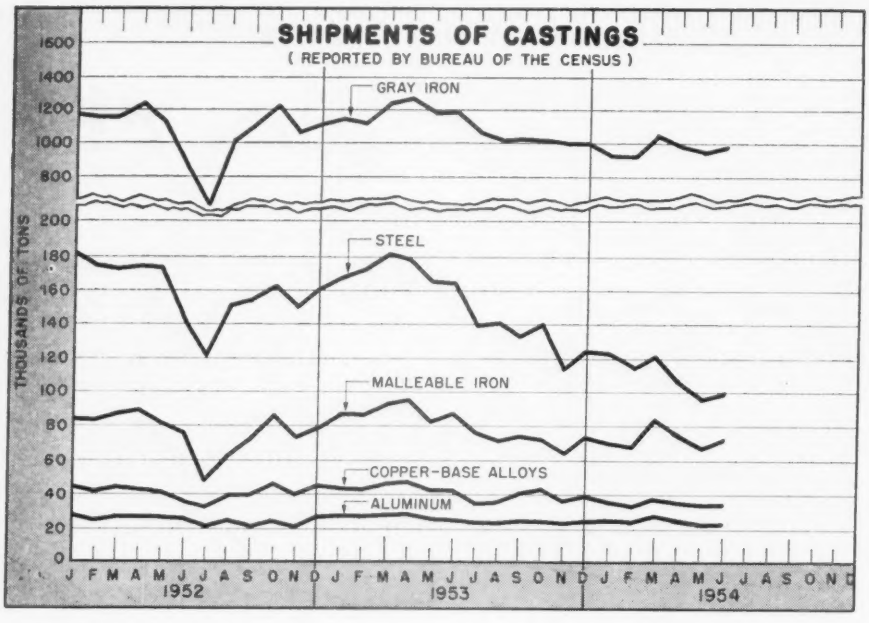
(Net tors[1])

	All Castings—Total	All Castings—For Sale	All Castings—Railway Specialties	Carbon Steel—Total	Carbon Steel—For Sale	Carbon Steel—Railway Specialties	Alloy Steel—Total	Alloy Steel—For Sale	Alloy Steel—Railway Specialties	Unfilled Orders[2]
1952	1,925,707	1,476,746	342,561	1,496,450	1,053,264	298,948	553,403	430,493	40,613	.....
1953										
June	164,665	125,984	30,381	116,358	88,260	27,767	48,307	38,130	2,614	475,756
6 mo.	1,034,996	798,699	188,638	732,235	560,753	172,255	302,771	241,006	16,383	.....
July	139,577	105,687	22,925	95,891	71,488	20,938	43,686	34,532	1,987	467,900
Aug.	141,340	107,941	25,026	97,076	73,784	22,637	44,264	35,003	2,389	418,927
Sept.	135,303	102,880	24,108	95,944	72,780	21,724	39,359	30,338	2,384	327,172
Oct.	140,702	106,788	25,354	100,568	76,118	23,449	40,134	30,988	1,905	313,684
Nov.	114,088	84,945	17,784	79,989	57,947	16,233	34,099	27,167	1,551	308,526
Dec.	123,281	91,017	18,685	86,465	62,377	16,998	36,674	29,952	1,687	278,389
Total	1,829,287	1,397,957	322,520	1,288,168	975,247	294,234	540,977	428,986	28,286	.....
1954										
Jan.	122,758	93,577	20,197	83,927	62,749	18,407	38,831	30,828	1,790	251,847
Feb.	116,520	88,699	17,938	81,433	60,638	15,961	35,087	28,061	1,967	234,634
Mar.	122,310	92,271	15,684	85,211	62,955	14,190	37,099	29,316	1,494	214,367
Apr.	105,788	78,754	11,031	72,118	52,389	9,538	33,670	26,365	1,493	197,857
May	94,610	70,596	9,454	64,546	46,651	8,342	30,064	23,945	1,112	182,502
June	100,022	72,881	8,639	69,021	48,327	7,552	31,001	24,554	1,087	169,594
6 mo.	662,008	496,778	82,943	456,256	333,709	73,990	205,752	163,069	8,943	.....

[1]Source: Bureau of Census. [2]For sale only. [3]All cast iron pipe is shipped for sale.

(Concluded on page 234)

FOUNDRY STATISTICS (Concluded from page 233)



INDEX OF FOUNDRY EQUIPMENT ORDERS

Foundry Trades Only

(Net Orders Closed, New Equipment)

	1953	1954
Jan.	99.6	173.5
Feb.	97.5	99.9
Mar.	132.2	82.7
Apr.	111.8	125.9
May	182.7	80.8
June	156.8	86.4
July	159.2	68.8
Aug.	236.3	...
Sept.	127.7	...
Oct.	87.2	...
Nov.	150.0	...
Dec.	161.2	...

Note: Figures are percentages of the base period 1947-49 taken as 100 per cent (monthly average). This is a new base period. Source: Foundry Equipment Manufacturers Association.

COKE PRODUCTION & CONSUMPTION

(Net tons)

	Production	Consumption Total	Consumption By Foundries
1952	68,254,109	67,865,639	3,102,446
1953			
May	6,824,810	6,752,823	272,673
June	6,625,223	6,692,864	254,830
6 mo.	39,739,691	40,019,079	1,561,515
July	6,748,229	6,654,080	217,504
Aug.	6,719,941	6,587,005	236,738
Sept.	6,404,143	6,330,441	236,119
Oct.	6,554,638	6,555,613	236,329
Nov.	6,208,155	6,039,813	216,837
Dec.	6,093,009	6,041,383	210,388
Total	78,467,806	78,227,414	2,915,420
1954			
Jan.	5,812,426	5,639,117	224,298
Feb.	4,889,717	4,920,651	211,114
Mar.	5,146,189	5,177,765	228,139
Apr.	4,693,036	4,569,843	212,272
May	4,802,245	4,656,950	204,958
June	4,639,979	4,683,646	192,661
6 mo.	29,983,592	29,647,972	1,273,442

INGOT BRASS & BRONZE

(Shipments in net tons)

	1953	1954
Jan.	24,423	20,661
Feb.	25,429	19,920
Mar.	28,256	23,653
Apr.	25,044	24,746
May	21,660	22,269
June	20,818	22,348
July	19,321	17,074
Aug.	20,156	.....
Sept.	21,463	.....
Oct.	22,280	.....
Nov.	21,860	.....
Dec.	20,541	.....
Total for year	271,251	.....

ZINC-BASE ALLOY

(Shipments of castings—1000 pounds[1])

	Shipments—Totals	Shipments—For Sale	Unfilled Orders[2]
1952	408,353	282,673	.....
1953			
June	48,806	31,010	88,533
6 mo.	288,663	192,441	.....
July	38,968	24,829	83,508
Total	521,253	349,022	.....
1954			
Jan.	40,396	27,257	61,754
Feb.	37,660	24,112	55,351
Mar.	42,991	28,828	52,544
Apr.	38,968	25,211	51,388
May	36,793	23,671	46,726
June	40,708	26,890	47,537
6 mo.	237,516	155,969	.....

PIG IRON PRODUCTION AND CONSUMPTION

	Production** (Standard grades—net tons) Total	Foundry	Malleable	Basic	Low Phos. Intermediate Low Phos. & Bessemer	Consumption* (By type of furnace—gross tons) Total	Cupola	Air	Electric
1952	61,306,723	2,864,722	3,013,267	48,253,390	7,175,344	61,550,961	5,438,294	449,646	118,820
1953									
July	6,425,855	213,469	344,377	5,145,135	722,874	5,579,692	367,081	19,880	15,471
7 mo.	44,258,363	1,595,537	2,270,778	35,711,131	4,950,925	39,437,021	3,027,048	172,234	92,413
Aug.	6,381,056	202,116	310,717	5,167,059	701,164	5,672,037	385,003	20,829	14,206
Sept.	6,121,399	209,444	310,441	4,926,986	674,528	5,378,517	393,292	21,775	16,039
Oct.	6,409,245	218,880	290,882	5,175,064	724,479	5,733,466	395,066	21,349	13,206
Nov.	5,995,511	201,047	277,181	4,859,252	658,031	5,324,537	343,233	17,528	15,842
Dec.	5,712,937	172,283	276,432	4,625,524	638,698	5,091,786	374,838	18,596	12,561
Total	74,878,511	2,599,307	3,736,431	60,465,016	8,347,817	66,637,364	4,918,480	272,311	164,267
1954									
Jan.	5,531,137	184,629	294,691	4,510,870	540,947	4,933,282	362,576	17,620	14,578
Feb.	4,764,613	156,178	272,707	3,911,670	424,058	4,293,942	351,824	17,257	9,892
Mar.	4,907,147	213,249	243,356	3,977,137	473,405	4,367,814	390,929	21,369	13,112
Apr.	4,449,289	155,249	256,662	3,630,901	406,477	4,021,957	375,045	26,553	10,497
May	4,572,252	154,768	231,479	3,741,671	444,334	4,188,269	367,437	16,453	16,531
June	4,683,629	175,759	200,154	3,853,444	454,272	.....	.....	.....	.....
July	4,590,076	182,130	182,527	3,790,999	434,420	.....	.....	.....	.....
7 mo.	33,498,143	1,221,962	1,681,576	27,416,692	3,176,583	.....	.....	.....	.....

IRON AND STEEL SCRAP CONSUMPTION

(Gross tons*)

	All Scrap Total	All Scrap Purchased	By Types of Furnace: Cupola Total	Cupola Purchased	Air Total	Air Purchased	Electric Total	Electric Purchased
1952	61,625,549	30,520,946	9,154,146	4,752,497	1,053,233	395,591	8,015,064	5,190,833
1953								
Apr.	6,227,089	3,026,533	921,589	474,185	106,449	41,004	820,647	531,509
May	6,294,920	3,105,598	861,404	450,477	92,703	35,566	798,098	523,606
5 mo.	31,118,448	15,223,054	4,313,408	2,225,049	489,987	186,082	4,016,976	2,615,053
June	5,951,170	2,835,875	876,320	454,905	99,799	38,934	743,530	468,129
July	5,539,468	2,597,365	729,114	369,283	74,815	26,755	691,521	443,263
Aug.	5,637,759	2,614,153	753,272	390,741	77,047	28,167	678,968	428,332
Sept.	5,395,721	2,393,773	782,131	405,274	80,866	29,032	595,523	363,706
Oct.	5,628,568	.....	779,444	.....	75,618	.....	566,878	.....
Nov.	5,064,565	.....	687,498	.....	60,200	.....	477,666	.....
Dec.	4,690,277	.....	755,276	.....	68,002	.....	442,818	.....
Total	69,005,976	.....	9,676,463	.....	1,026,334	.....	8,263,880	.....
1954								
Jan.	4,574,384	.....	711,335	.....	71,202	.....	505,536	.....
Feb.	4,385,340	.....	704,535	.....	67,263	.....	462,095	.....
Mar.	4,637,573	.....	783,529	.....	82,337	.....	517,702	.....
Apr.	4,582,862	.....	748,766	.....	79,183	.....	518,048	.....
May	4,776,603	.....	710,159	.....	67,368	.....	506,582	.....
5 mo.	22,956,762	.....	3,658,324	.....	367,353	.....	2,509,963	.....

*Source: U. S. Dept. of Interior, Bureau of Mines. **Source: American Iron & Steel Institute. [1]Source: Bureau of the Census. [2]For sale only.

P&H FOUNDRY CRANES

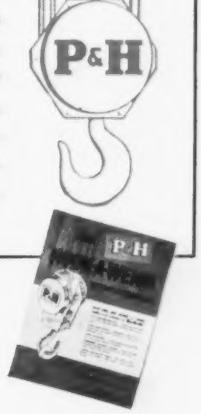
a new "find" for the foundries!

P&H MAGNETORQUE®

Actually, we've built nearly 1000 P&H Overhead Cranes with Magnetorque AC control. So it's not brand-new. But many foundries thought their need for fine speed regulation could be met only with DC dynamic lowering. That is, until they tried Magnetorque. Now that they've "found" it, more and more are turning to Magnetorque. Here, with the convenience and economy of AC power, are the finest speed-load characteristics on *any* crane. Here's complete freedom from mechanical load brakes — and their service headaches. Here's your best guarantee against service interruptions. Magnetorque requires no adjustments. And it lasts the life of the crane. If you haven't the facts, ask us to send you Bulletin C-50.

have you heard about "HOOK-A-WEIGH"?

It's the new P&H electronic crane scale that weighs your loads as you handle them — eliminates separate weighing operations. Provides visual or printed records on tape or cards. Can be installed on any crane. Write for Bulletin C-47.



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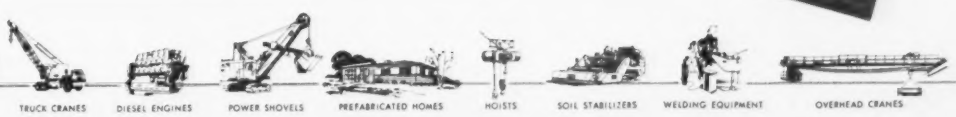
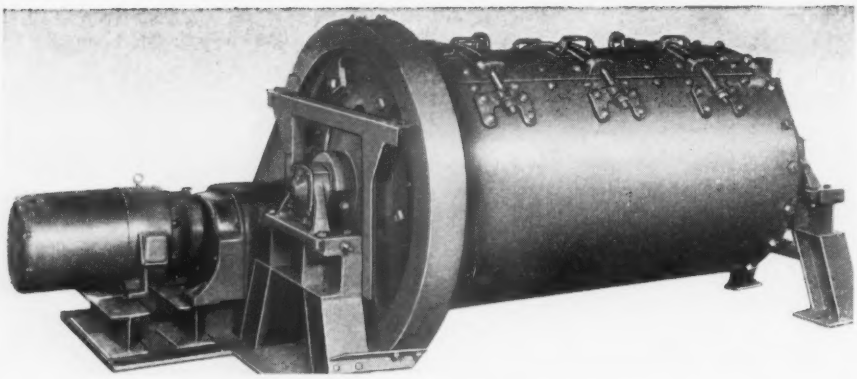




Typical tumbling mill, 36 in. diam and 60 in. long. Motor has heavy magnetic brake for stopping mill and holding it for convenient loading and unloading

Cleaning Castings by TUMBLING

By F. A. EBELING
Sales Manager
W. W. Sly Mfg. Co., Cleveland

YEARS ago tumbling mills were used almost universally for cleaning such castings as would fit into a mill of reasonable size. Practically all castings which could be lifted by a man, say up to 75 lb in weight, were tumbled. In many cases larger castings were also tumbled, their handling being done by hoists or other mechanical means.

A wide variety of castings still are tumbled by certain foundries. Among others they include such products as agricultural machinery parts, brake shoes, motor bell ends, soil pipe and fittings, as well as automotive brake pedals, manifolds, transmission cases, flywheels, pump housings, etc.

The purpose of tumbling is to clean castings by removal of sand and scale, to smooth the surface of the castings, and to remove parting fins and other surface irregularities. In many cases it has the advantage of peening up minor surface defects which do not affect structural strength. The result of tumbling is a better looking and smoother casting, the reduction or elimination of costly grinding and chipping of parting fins, a better surface for painting. Tumbling malleable castings while in the white iron state is said to facilitate the subsequent annealing operation.

For most effective results, a tumbling mill should be loaded full. After a few revolutions of the mill, the castings settle somewhat, creating a small vacant space in the mill for greater tumbling action. Plenty of hard iron stars of proper size should be used. On the average 30 per cent of the mill capacity should be filled with stars. The cleaning of the castings by the tumbling process is accomplished by abrasion between casting and casting and between casting and star. The pressure of the weight of the load adds to the cleaning effect of these contacts. The important item for most economical cleaning by tumbling therefore is to use plenty of stars to create as many contacts as possible in a given time or per revolution of mill barrel. To repeat, the more contacts there are between casting and casting and between casting and star in a given length of time, the faster and better the cleaning action.

The capacity of a mill is determined by the time required to do the job and the quantity of castings to be cleaned. As an example, a mill 36 in. in diameter by 60 in. inside length has a capacity of 35 cu ft. Castings on the average weigh about 100 lb per cu ft, so a 36 x 60-in. mill will hold about 3500 lb of castings and stars, or over 1½ tons of castings per load. Tumbling time per load may vary from one to two hours; allowing two hours per shift for loading and unloading, a mill can produce from three to six loads per 8-hour shift, or 4½ to 9 tons of castings.

The cost of tumbling these castings may be estimated as follows:

Two hours for two men loading and unloading	$ 8.00
7½ hp for six hours @ 1½c per hp/hr.	.675
5% depreciation $150/yr.	.60
5% maintenance	.60
Cost of stars	.125
Total per shift	$10.00

This is the cost for cleaning by tumbling of from 4½ to 9 tons per shift; it amounts to approximately $2.22 to $1.11 per ton, or about 1/10 to 1/20-cent per pound. To this should be added the cost of operation and maintenance of a suitable dust exhaust system, but this is a minor item.

Frequently the cleaning of castings by tumbling is done by unskilled labor during an evening shift or during and after shakeout, using the shakeout gang to load and unload the mills.

Maintenance of tumbling mills is a negligible item. The mill barrel trunnions run in sealed roller bearings. The mill is driven by a gearhead motor of special heavy construction. The heavy steel shell of the mill barrel may wear out in four to six or more years and can be easily replaced. The gearhead motor is equipped with a heavy magnetic brake which stops and holds the mill in any desired position for loading and unloading.

In some cases it is desirable to run the mill in one direction for one-half of the tumbling time, and in reverse direction for the other half of the time. In such a case the motor starter is furnished with a start-reverse-stop pushbutton station.

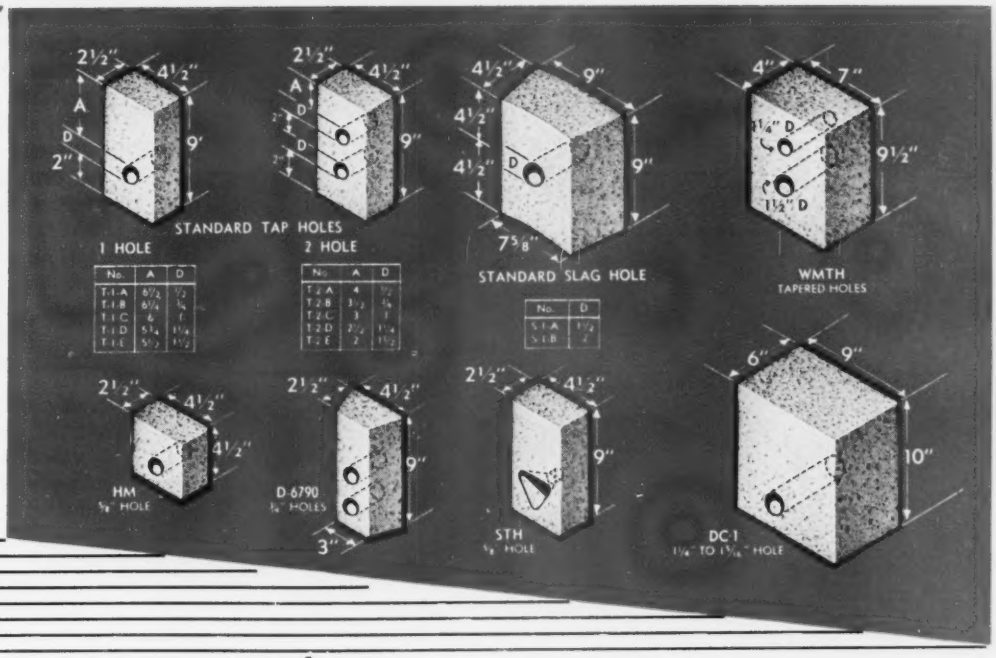
Reversing the direction of rotation of the mill barrel is particularly desirable when tumbling castings which, because of their shape, must be packed in the mill rather than thrown in haphazardly. In such a case, the circulation of the stars between the castings does most of the cleaning, and reversing the mill gives the stars a chance to contact surfaces which were not contacted before.

Tumbling soil pipe is a very cheap method of cleaning. Using plenty of stars, a load is cleaned in as little as 10 minutes. For handling soil pipe, a mill is equipped with special renewable heavy steel plate liners at each end where the bell ends of the soil pipe pound against the mill shell.

Fragile castings may be tumbled successfully without breakage. In a mill loaded full there is no violent cascading action. The castings simply shift and are agitated by the re-

(*Continued on page* 238)

save time
and money
with these
ready-to-go
cupola
specialties
from Ironton



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● **EARL A. SWENSON** has now added North Carolina to his territory of Virginia, West Virginia, Pittsburgh area, and New York City. These states and cities will be served from his new address, 5301 Fort Avenue in Lynchburg, Virginia.

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***IRONTON* NOJOINT**
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CHATTANOOGA, Tenn. Phone 7-6497
CHICAGO, Ill. EUclid 3-3770
CLEVELAND, O. [illegible]
CLEVELAND, O. VUlcan 3-8200
DETROIT, Mich. WOodward 3-8125
HARTFORD, Conn. Phone 33-0941
JACKSONVILLE, Fla. Phone 3-5586
KENTWOOD, La. Phone 2191
MIAMI, Fla. [illegible]
MILWAUKEE, Wis. BRoadway 6-4790
PHILADELPHIA, Pa. JEfferson 5-1012
ST. PAUL, Minn. EMerson 6312
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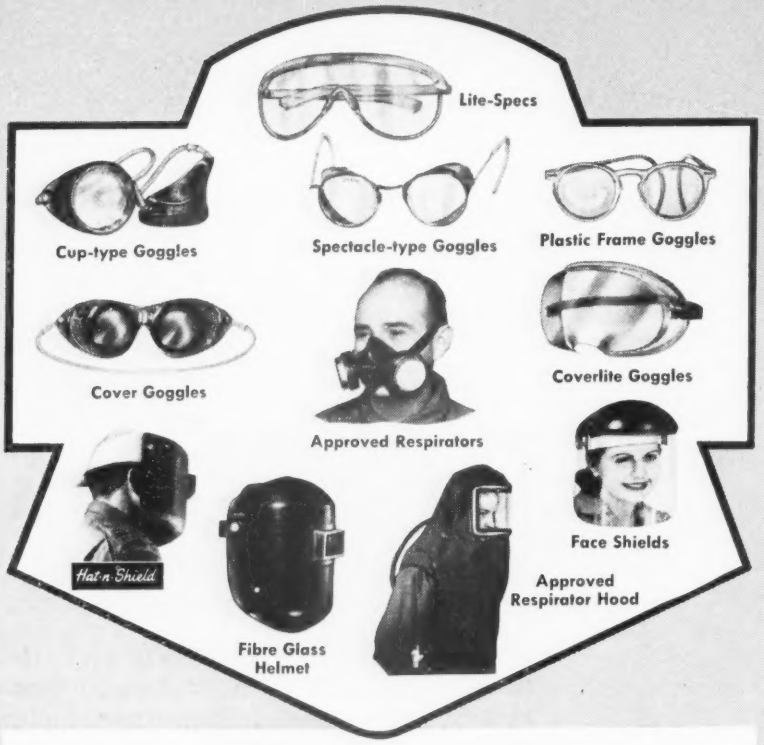

WHERE TO BUY IT

ATLANTA, GA.
Guardian Safety Equipment Co.
427½ Moreland Avenue, N. E.

BIRMINGHAM, ALA.
L. P. Harless Company
2627 Seventh Avenue, South

BOSTON, MASS.
General Equipment Corporation
261 Franklin Street

BUFFALO, N. Y.
The Watson Company
1443 Main Street

CHICAGO, ILL.
Universal Safety Equipment Co.
5115 Diversey

CINCINNATI, OHIO
Williams & Co., Inc.
3231 Fredonia Avenue

CLEVELAND, OHIO
Williams & Co., Inc.
3700 Perkins Avenue

COLUMBUS, OHIO
Williams & Co., Inc.
851 Williams Avenue

DALLAS, TEXAS
Guardian Safety Equipment Co.
900 Jefferson Tower Bldg.

DETROIT, MICH.
Averill Equipment Company
19225 Conant Avenue

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Safety, Incorporated
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Safety Equipment Distributing Co.
832 W. Main Street

LITTLE ROCK, ARK.
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LOS ANGELES, CALIF.
Guardian Safety Equipment Co.
7223 S. Main Street

LOUISVILLE, KENTUCKY
Williams & Co., Inc.
1109 S. Preston Street

MILWAUKEE, WIS.
Universal Safety Equipment Co.
3155 S. 7th Street

PEORIA, ILL.
Universal Safety Equipment Co.
116 S. Garfield

PHILADELPHIA, PA.
Guardian Safety Equipment Co.
214 S. 45th Street

PITTSBURGH, PA.
Williams & Co., Inc
901 Pennsylvania Avenue

ST. LOUIS, MO.
Safety, Inc.
2608 Olive Street

ST. PAUL, MINN.
Continental Safety Equipment, Inc.
1551 Selby Ave

SALT LAKE CITY, UTAH
Universal Fire & Safety
Equipment Co., Box 1587

SAN FRANCISCO, CALIF.
Guardian Safety Equipment Co.
50 Hawthorne Street

SPOKANE, WASH.
Spokane Safety Appliances
W. 314 Pacific Ave.

TOLEDO, OHIO
Williams & Co., Inc.
650 E. Woodruff Avenue

TULSA, OKLA.
Guardian Safety Equipment Co.
1742 S. Main Street

WICHITA, KANS.
Guardian Safety Equipment Co.
723 S. Broadway

MEXICO CITY, D. F.
Safety Equipment S. A.
Sullivan—95

MONTREAL, CANADA
The Butler Optical Company, Ltd.
1520 Mountain Street

CHICAGO EYE SHIELD COMPANY
2324 Warren Boulevard, Chicago 12, Illinois

CESCO FOR SAFETY

(*Continued from page* 236)

volving barrel, without strain on the castings. It is important, with any kind of castings, to load the mill full. After a few revolutions, the castings and stars will settle enough to provide for sufficient agitation.

For dry tumbling, the mills permit air to be passed through them for removal of sand and dust during the tumbling operation. One head casting of the mill barrel has open-

"The boys would like permission to cast a few pop bottles for the World Series."

ings for admission of air. The steel end liners of the barrel are perforated. The other head has a hollow trunnion with an overmounted suction box which is connected to an exhaust system with dust collector. The coarse refuse particles enter the suction box and are discharged by a counterweighted trap. The fine dust goes to the dust collector. In some cases a handful of graphite is thrown into the suction inlet openings a few minutes before the load is finished-tumbling. This gives the castings a shiny dark finish.

Sometimes the noise created by tumbling mills is objectionable. This noise can be practically eliminated by lining the inside of the mill barrel with canvas-backed rubber 1 in. thick. This rubber sheeting is held in place by several steel bars which in turn are fastened by countersunk bolts, permitting easy and quick replacement. Such rubber lining also protects the mill barrel shell against wear.

The same mills can be used for wet tumbling by making them watertight with a rubber-gasketed door. Wet tumbling is often used for cleaning brass castings. The sand from the castings acts as a polishing agent. For a high polish finish, more sand, or often sandstone chips, are

added to a load of castings. Such mills can be furnished with valves for inlet and outlet of water and for final rinsing out of the fine sand just before finishing a load.

Cleaning of castings by tumbling is a very low cost operation for foundries producing small and medium sized castings.

Vacuum Metallurgy Is Symposium Topic

Vacuum melting, vacuum heat treating and the properties of the metals and alloys thus produced will be discussed as a part of the 106th meeting, Oct. 3-7, of the Electrochemical Society at the Hotel Statler, Boston. The symposium on vacuum metallurgy, to be held Oct. 6-7, also will include presentation of new vacuum equipment and techniques, a session on the volatility of alloy components, the use of such data in the purification and recovery by vacuum distillation. Dr. James D. Nisbet, director of research of the Universal Cyclops Steel Corp., will make the keynote address.

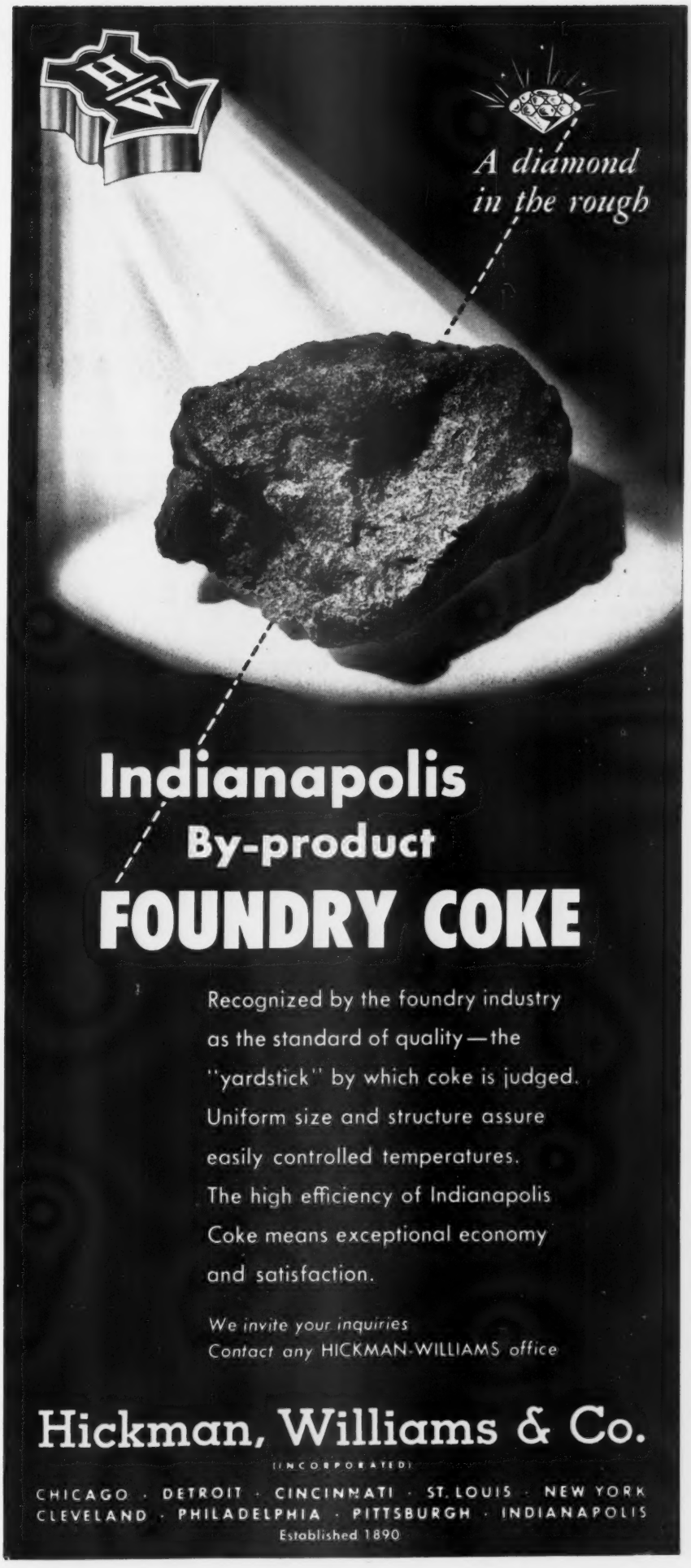
Book Describes Details Of New Safety Devices

More than 90 safety devices are described in the National Safety Council's new book, "Safety Devices and Ideas." Each idea is illustrated showing clearly the details of construction. The ideas are further described in the text. Most of the devices are not commercially available, having been designed and constructed by plant personnel to meet some particular hazard. The book is available for $1.25 to council members and $2.50 to others from the National Safety Council, 425 North Michigan Ave., Chicago 11.

Book Review

ASTM Standards on Materials for Radio Tubes and Electric Devices and Electrical-heating, Resistance, and Related Alloys, paper, 230 pages, 6 x 9 in., published by the American Society for Testing Materials, 1916 Race St., Philadelphia 3. Price $2.75.

This 1954 compilation contains in their latest approved form 44 widely used ASTM standards including 30 test methods, 10 specifications and 4 recommended practices. Materials and subjects cover electrical-heating alloys; electrical-resistance alloys; electric-furnace alloys; radio tubes, electronic devices and lamps; heat-resisting alloys; electrical contact materials, and thermostat metals.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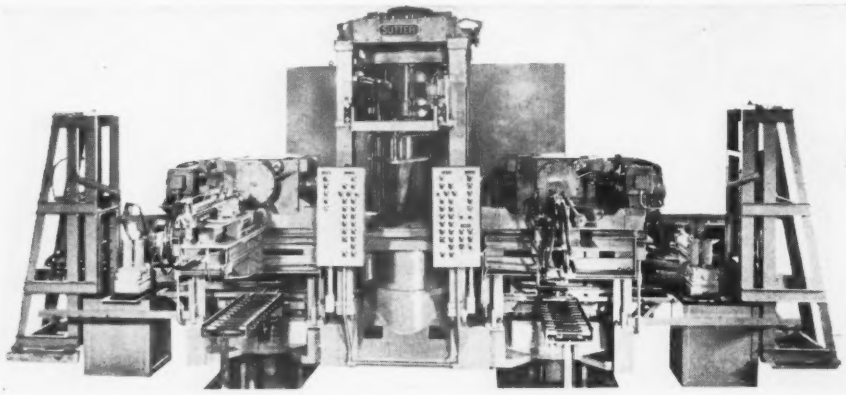
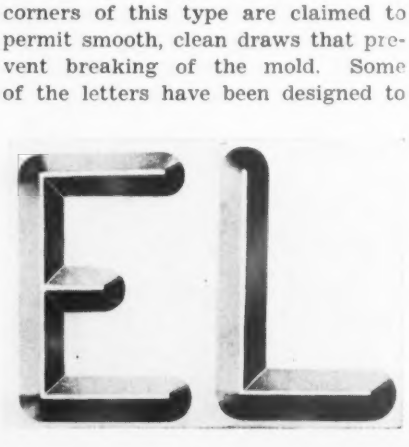


Core Blower: Sutter Products Co., 2005 Westwood Ave., Dearborn, Mich. Two-station automatic core blower and core draw machine produces automotive barrel and crankcase cores used in cylinder block molds. Machine sprays the corebox and the car containing the box swings to an upright position as it moves under the blow head. An air cylinder under the car moves the car assembly up to the blow plate and the core is blown. Car is lowered with a pin assembly moving over the blown core. The bottom air cylinder raises car a second time, squeezing the pins into the filled corebox to disperse the sand and provide steam holes to assist in drying the core. The car moves out to the end of the track, rolls over, and the draw table rises to meet the top of the corebox. When table is up a limit switch opens the four sides to allow the core to be drawn. Core moves out the end of the machine over a dip tank, to be lowered into a blacking solution. Core is elevated to a push-off conveyor, ready for drying.

For More Details Circle No. 1—Page 243

Pattern Letters: Canton Products, P. O. Box 981, Canton 1, O.—Pattern letters have been developed to overcome problem of poor draws caused by sharp corners. Round corners of this type are claimed to permit smooth, clean draws that prevent breaking of the mold. Some of the letters have been designed to produce an open-type letter to eliminate spots where sand pockets are liable to form. Sizes presently available are ¼, ⅜, ½, ¾, and 1 in. New sizes are being added as requirements indicate.

For More Details Circle No. 2—Page 243



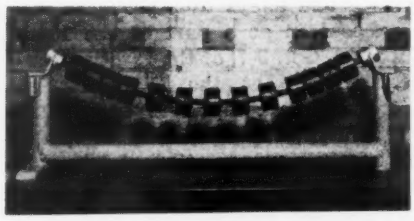
Refractories Gun: True Gun-All Equipment Co., 122 North Kirkwood Rd., St. Louis 22, Mo.—Method of pressure gun application of refractories is said to prevent dusting and minimize rebound loss because the mix used is wet. Materials are blended in dual tanks on the machine, mixed with an exactly measured amount of water for proper consistency to assure perfect adhesion. Air action in the gun further homogenizes the mix, resulting in an even texture without dry spots when applied.

For More Details Circle No. 3—Page 243

Drop-Bottom Box: Union Metal Mfg. Co., Canton, O.—Side-dumping drop-bottom box is for use in congested areas. Boxes are corrugated construction and can be used anywhere a fork truck can operate. They can be drop-bottom dumped from either side or the back in close quarters, and at any angle from a narrow aisle. Discharge point remains constant during dumping operation because truck's forks rest against an I-beam abutment on the chute end of the box. Two sizes are available. The larger size holds 6000 lb in a volume of 20.2 cu ft and the smaller accommodates 4000 lb in 11.2 cu ft.

For More Details Circle No. 4—Page 243

Suspension Idler: Joy Mfg. Co., 338 South Broadway, New Philadelphia, O.—Suspension type idler for belt conveyors makes possible a light weight, low height section that employs no bolts. Idler consists of a cable with a bearing at each end and several rubber cylinders molded onto the cable to provide a continuous concave support for the belt. Cylinders cushion the belt throughout the conveyor's length and the idler, being flexible, shapes itself to the load, permitting heavy cross-sectional loading of the belt. Complete idler can be removed or installed without stopping the belt, according to the manufacturer.



For More Details Circle No. 5—Page 243

Aluminum Pigs: Reynolds Metals Co., 2500 South Third St., Louisville, Ky.—Two master alloy aluminum pigs have been added to company's line. Alloys are said to provide a uniform analysis by blending with secondary materials to control undesirable impurities. Pigs reportedly can be charged with gates, risers, and sprues to eliminate problems of silicon, iron, zinc and magnesium pickup. One alloy has a controlled chemical analysis of 6 per cent Si, 4 per cent Cu, nominal Fe, balance Al. Other alloy has an analysis of 9 per cent Si, 3½ per cent Cu, ¾ per cent Fe, balance Al. Pigs are in 50-lb size.

For More Details Circle No. 6—Page 243

Repair Compound: Carl H. Biggs Co., 2255 Barry Ave., Los Angeles 64, Calif.—Epoxy resin compound is used to fill sand pits, small gas holes, shrinkage, cracks, deep nicks and scratches, machining flaws and porous areas in precision metal parts, as well as to fill blowholes of various sizes in machined and raw castings. Applicable to ferrous and nonferrous metal, the compound is furnished in aluminum, brass, bronze, zinc, iron and magnesium. Viscosity can be controlled from a thin liquid

to a heavy putty-like paste. Easy to apply, it will cure without shrinkage at room temperature and may be sanded or machined. According to the manufacturer, it is impervious to all acids, alkalies, oils and greases. Material is supplied in a kit as a three-component compound. Kit contains a can of resin, a bottle of hardening agent and a supply of finely pulverized metal.

For More Details Circle No. 7—Page 243

Swing Riddle: Beardsley & Piper Division, Pettibone Mulliken Corp., 2424 North Cicero, Chicago 39, Ill.—Swing riddle for use with all types of

molding machines is mounted on a steel base for operation alongside a molding machine. To riddle a layer of sand onto the pattern, the operator swings the riddle into position over the pattern. A limit switch starts the riddling action and ends it automatically when the operator swings the riddle away from the pattern. A variety of riddling screens are available to meet any requirements under all kinds of conditions.

For More Details Circle No. 8—Page 243

Corebox Sealers: Martin Engineering Works, Neponset, Ill.—Three styles of tough, oil-proof rubber for use as corebox inserts are said to be ideal for sealing between blow plate and sand magazine and for sealing open-faced coreboxes. Manufacturer reports they hold the parting line on coreboxes without steel facing and can be installed easily in old or new boxes. Three styles offered are a solid round strip, a thick-walled, round tube, and a square, solid strip.

For More Details Circle No. 9—Page 243

Shipping Container: Pressed Steel Division, Republic Steel Corp., 6100 Truscon, Cleveland, O.—Lightweight, collapsible steel box and skid unit for shipping combines strength, lightness, and compactness to withstand considerable abuse. Made of 18-gage steel with 16-gage reinforcements, the unit is rigid and strong. Inside measurements are 30 x 30 x 30-in. Fallet has 3½-in. clearance. Stacking feature insures nesting four ways to prevent sliding. Collapsed container measures 31½ x 31½ x 9-in. high.

For More Details Circle No. 10—Page 243

Push-Type Cranes: Industrial Crane & Hoist Corp., 315 North Ada St., Chicago 7, Ill.—Firm has expanded its line of underhung push-type cranes with improved construction features. A light-duty model with five capacity ranges up to 4000 lb is available. A heavy-duty model has seven capacity ranges up to 8000 lb. Crane bridge girder is of high-carbon manganese steel, rolled in an I-beam shape fitted with end stops to limit hoist trolley travel. End trucks on heavy-duty models are welded in jigs to form a rigid structure and are jig bored for alignment and even load bearing of all wheels and axles.

For More Details Circle No. 11—Page 243

pH Meter: Analytical Measurements Inc., 585 Main St., Chatham, N. J.—Pocket-size pH meter and companion probe unit reportedly permit instant, on-the-spot pH determinations anywhere. The case comes with a combination hand and shoulder strap, allowing the instrument to be slung over the shoulder

or hung around the neck, leaving both hands free. Meter is scaled from 2 to to 12 pH for easy reading, and a simple adjustment gives readings from 0 to 14. Accuracy of 0.1 pH is obtainable, according to the manufacturer. Hearing-aid type batteries provide up to 1300 hours operation. One knob control and continuous reading features simplify operation.

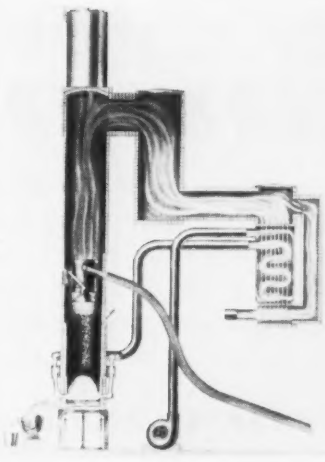
For More Details Circle No. 12—Page 243

Band Machine: DoAll Co., 254 North Laurel Ave., Des Plaines, Ill.—Use of miscellaneous attachments and accessories on 16-in. band ma-

Heat Exchanger Uses Thin-Wall Steel Tubes

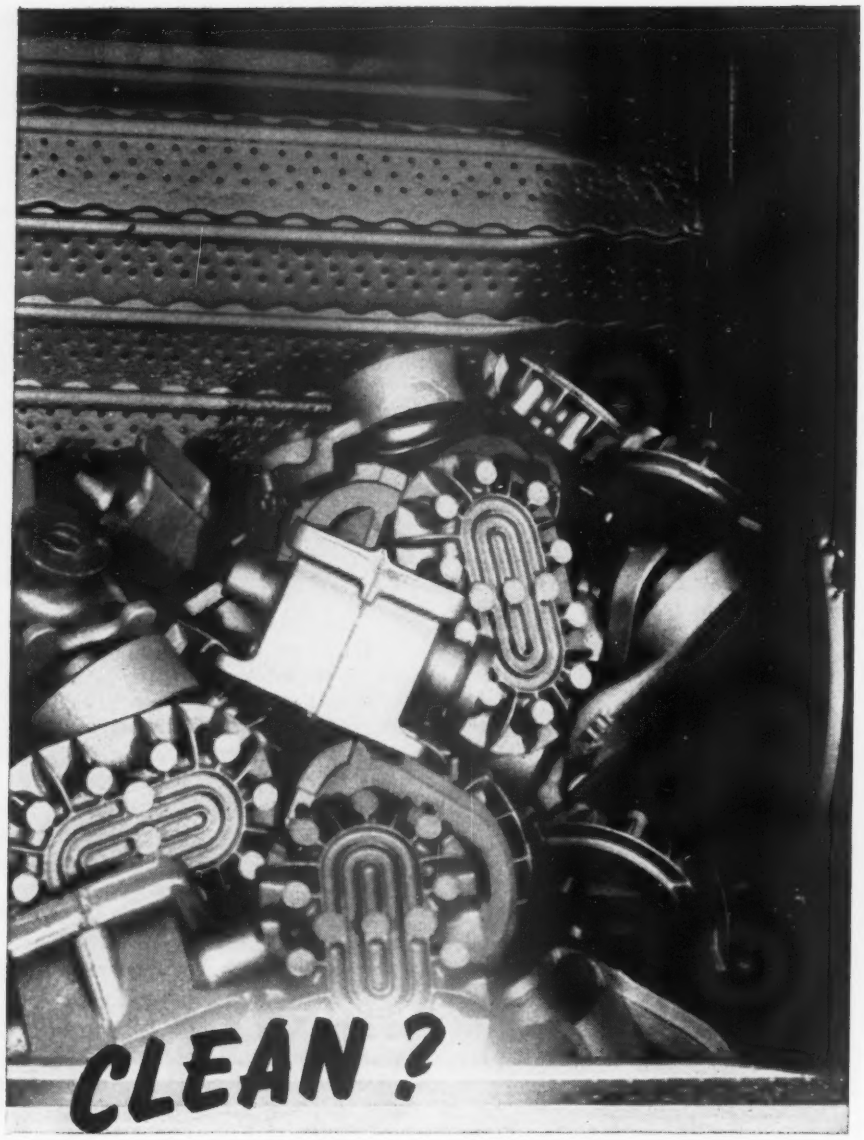
HEAT exchanger for use with company's single-pass recuperative type hot blast system uses thin-wall alloy steel tubes to reduce weight and minimize floor space required. It is designed for hot blast use in foundries producing upwards of 100 tons per day and for specialty shops producing "hard to make" castings. Exchanger can be used with either open or closed top cupolas and is equipped with an automatically controlled by-pass to provide uniform air at desired temperatures. Temperature controls are completely automatic for holding temperature of the blast air uniform after operating temperature is reached.

A complete closed top cupola hot blast system, using this heat exchanger, also includes a combustion chamber, cupola caps, gas



ducts, dust collector and temperature controls. Manufacturer is the Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

For More Details Circle No. 13—Page 243



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PITTSBURGH CRUSHED STEEL CO., Pittsburgh, Pa.
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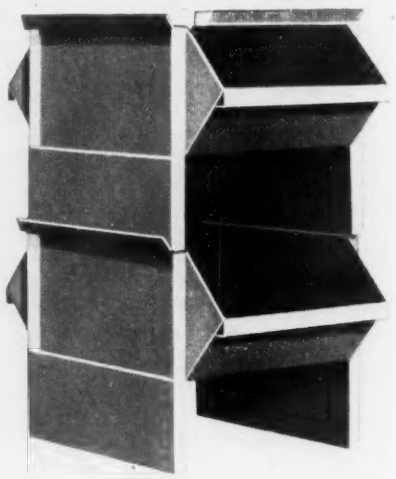
MEMBER FEMA

chine adds versatility for tool room and light production work. Sawing, band filing, metal polishing and slicing of many materials can be performed by application of the proper tool, tool guides, attachments and accessories designed for specific operations. Carbide tools reportedly can be finished with a surface comparable to that obtained with diamond wheels. A variety of models with fixed or variable speeds and speed ranges between 5 and 5200 fpm are available.

For More Details Circle No. 14—Page 243

Steel Pallet: Galion Allsteel Body Co., Dept P, Galion, O.—Scow-type steel pallet reportedly is ideal for handling large or small parts



during machining operations or for storage of unprocessed or finished parts. Deck is 12 in. off floor and, to ease handling by lift trucks, units are fitted with built-in guides and stops. They can be stacked six high. Pallets are 47 in. long x 30 in. wide x 29 in. high. Weight is 236 lb.

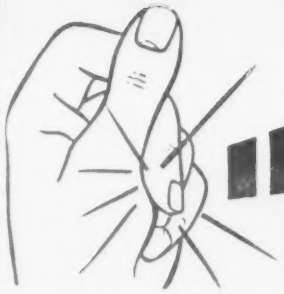
For More Details Circle No. 15—Page 243

Limit Switch: Micro Switch, Division of Minneapolis - Honeywell Regulator Co., Freeport, Ill.—Heavy-duty precision limit switch is designed for use on all types of machinery and industrial equipment where dust, dirt, abrasives or liquids may be present. Entire housing, including the operating head with its actuator and return mechanism, is sealed. Switch may be mounted in almost any position in relation to the means of actuation.

For More Details Circle No. 16—Page 243

Filter: Mechanical Industries Inc., 905 Grogan Bldg., Pittsburgh 22, Pa. —Control of fumes, dust and smoke is accomplished by a moving granule principle, rather than through use of cloth bags or water spray. Gases are passed horizontally through two

(*Continued on page* 245)



IDEAS FOR FOUNDRYMEN

HERE ARE QUICK REVIEWS OF NEW LITERATURE—available to foundrymen as "idea" and reference information. Readers in the United States and Canada may obtain copies by using the attached cards. Readers in foreign countries should write direct to the manufacturer offering literature.

81. Furnace Conveyor Belts

American Brake Shoe Co., Electro-Alloy Div., Elyria, O.—General-purpose and heavy-duty Thermalloy furnace conveyor belts are covered in 6-page illustrated folder T-241. Maximum service temperatures for these belts run up to 1800° F. They are available in 3 and 4-in. pitches carrying up to 80 lb per square foot. Construction details, load curve charts and other data are shown.

82. Colloidal Dispersions

Acheson Colloids Co. Div., Acheson Industries Inc., Port Huron, Mich.—Uses of colloidal dispersions in industry are described in bulletin 460. A centerfold table lists 40 basic dispersions of graphite, molybdenum disulfide, vermiculite and zinc oxide in carriers such as water, oil, volatile hydrocarbons, resin solutions, alcohol, glycol and wax emulsions.

83. Screens & Conveyors

Simplicity Engineering Co., Durand, Mich.—28-page catalog No. 53 is descriptive of line of gyrating and horizontal action screens. Scalping, sand and gravel, crushed rock, mining sizing, dewatering and light aggregate screens are covered as are vibrating bin feeders and conveyors. Screens have opening sizes ranging from ⅛ to 3 in.

84. Shell Molding Machine

Centrifugal Casting Machine Co., P. O. Box 947, Tulsa, Okla.—Features of the Pneudraulic model 12 x 18-in. (pattern size) semiautomatic shell molding machine are pointed up in 4-page bulletin 154. Unit will produce from 45 to 60 shells per hour continuously.

85. Airless Blasting Machine

American Wheelabrator & Equipment Corp., 1102 South Byrkit St., Mishawaka, Ind.—Bulletin 944 describes a 72-in. swing table airless blasting machine which requires no pit for the abrasive hopper. Electrical and mechanical specifications and views showing over-all dimensions are included. The various mechanical components of the machine are described and illustrated.

86. Carbon and Graphite News

National Carbon Co. Div., Union Carbide & Carbon Corp., 30 East 42nd St., New York 17, N. Y.—Significant developments in steel mill and foundry practice and the application of carbon and graphite in the plant are to be covered in a quarterly publication, "Carbon and Graphite News." The regular series of booklets will encompass the whole field of metal production with the first several issues devoted to the electric arc furnace.

87. Electric Tractor

Mercury Mfg. Co., 4044 S. Halsted St., Chicago 9, Ill.—Four bulletins describe a new electric tractor used in the trackless train system of material handling. Each bulletin includes detailed specifications, illustrations and dimensioned drawings. Bulletin T-201 describes the four-wheel standard model. T-202 the four-wheel heavy-duty model, T-203 the twin-three wheel standard model and T-204 the twin-three wheel heavy-duty model.

88. Chaplets, Skim Gates

Smith & Richardson Mfg. Co., Geneva, Ill.—Many sizes of chaplets, hinge tubes, tin forms, skim gates and related items are described in catalog 154. Illustrations and useful information are given for each item.

89. Sand Conditioner

Monsanto Chemical Co., Plastics Division, Springfield 2, Mass.—Product information bulletin No. 82 describes a polymeric sand conditioning resin which is said to produce even clay distribution. Illustrations of castings and charts and graphs aid explanation of the resin's prop-

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We regret that owing to postal and mechanical problems over which we have no control, we are able to process literature requests mailed in the *United States and Canada only* until further notice. We suggest that you write direct to the manufacturer for product information at the addresses given in advertisements and literature descriptions.

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erties. Information on converting sand systems and the making of sand tests completes the booklet.

90. Beryllium Alloys

Penn Precision Products Inc., 501 Crescent Ave., Reading, Pa.—Beryllium-copper, beryllium-nickel, beryllium-aluminum and beryllium-iron alloys available in ingot form for casting or alloying are discussed in bulletin 3, "Beryllium Casting Ingots and Master Alloys." Information on composition, properties and uses is included.

91. Pressure Recorders

Foxboro Co., Foxboro, Mass.—Complete description of a new line of pressure measuring elements is given in bulletin 6-10. The 24-page publication explains pressure instruments designed for direct measurement, remote transmission and automatic control. Element materials, case and linkage features, standard process ranges and accessories also are discussed.

92. Portable Tools

Skil Corp., 5033 Elston Ave., Chicago 30, Ill.—Detailed data on extensive line of electric and pneumatic tools are found in 48-page illustrated 1954 catalog. Included are portable saws, drills, belt sanders, planes, drivers, blowers, shears, floor sanders, hammers, polishers and others. Various accessories are also covered.

93. Testing Machines

Detroit Testing Machine Co., 9390 Grinnell Ave., Detroit 13, Mich.—Four models of Brinell hardness testers, a sheet metal ductility tester, two tensile test machines and a universal testing machine are described in 8-page loose-leaf catalog. Units are illustrated and specifications and other data are given.

94. Soft, Bead-Type Sealer

Presstite Engineering Co., 3796 Chouteau Ave., St. Louis 10, Mo.—Foundry operations using an extruded soft sealing compound between copes and drags are pictured in a leaflet. The new sealing compound is furnished in rope-like beads of uniform thickness. Samples and complete details are furnished on request.

95. Ladle Heating and Drying

Hauck Mfg. Co., 124-136 Tenth St., Brooklyn 15, N. Y.—Bulletins 721 and 1087 show applications of stationary and portable type oil and gas-burning equipment for ladle heating and drying.

96. Conveyors

Prab Conveyors Inc., 19815 East Nine Mile Rd., St. Clair Shores, Mich.—Custom built conveyor equipment, a precision piano hinge steel belt conveyor elevator, a two directional, enclosed bulk material handling elevator and an automatic magnetic elevator are described in catalog 370. Illustrations and typical applications are included.

97. Crane Controls

General Electric Co., Schenectady 5, N. Y.—Complete description of a new line of alternating current crane controls is found in bulletin GEA-6112. Special emphasis has been given to the application, installation and selection of crane control. Illustrations include speed-load charts, circuit diagrams and installation photographs.

98. Industrial Rubber

Raybestos-Manhattan Inc., Manhattan Rubber Div., Passaic, N. J.—Rubber products for industry are described in catalog 25-C which covers V-belts, transmission belts, conveyor belts, all types of hose and molded products.

99. Grinding Wheel Dressers

Desmond-Stephan Mfg. Co., Urbana, O.—Catalog 75 illustrates a complete line of grinding wheel dressers and replacement parts. Tool descriptions and specifications are included.

IMPORTANT READING FOR FOUNDRYMEN

We have a limited quantity of the following reprints which we can furnish while they last.

100. Predicting Casting Costs

Based on statistical analysis of actual parts, this reprint of a *Machine Design* article presents a scientific approach to the accurate determination of casting costs at early design stages. It is written by Philip Tripoli, production design engineer of Northrop Aircraft Co. and contains much information in chart form.

101. Statistical Quality Control

Application of statistical quality control to the foundry is covered in this reprint of a FOUNDRY article written by A. J. Kukla of Alcoa's Buffalo works. Although it covers a magnesium foundry, the principles and benefits described apply to other types of foundries.

102. Common Sense in Cores

"A core is a problem in economics," states Warner B. Bishop, manager of the Foundry Products Division, Archer-Daniels-Midland Co. in this reprint of a FOUNDRY article. In the article ways of improving present methods of core production are examined.

103. Flasks

"How to Select and Maintain Flasks" is the title of an article reprinted from FOUNDRY. The factors which go into determination of the proper size of flask are discussed and valuable suggestions on maintenance are given.

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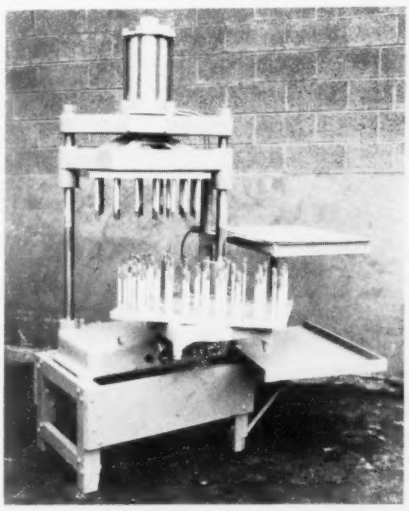
(*Continued from page* 242)

or more cells containing moving granules of a variety of types, depending upon the type of filtering being done. Granule cells are arranged in parallel or in series, and rate of flow is controlled by a rotary discharge valve. As the gases pass through the cells, solid matter strikes against the granules and adheres. The clean gases pass through labryinths in the granules to the exhaust system beyond the cells.

For More Details Circle No. 17—Page 243

Shell Bonding Fixture: Shell Process Inc., McKinstry Ave., Chicopee, Mass.—Shell bonding fixture is designed to handle shell molds up to 20 x 30 in. Molds which project as



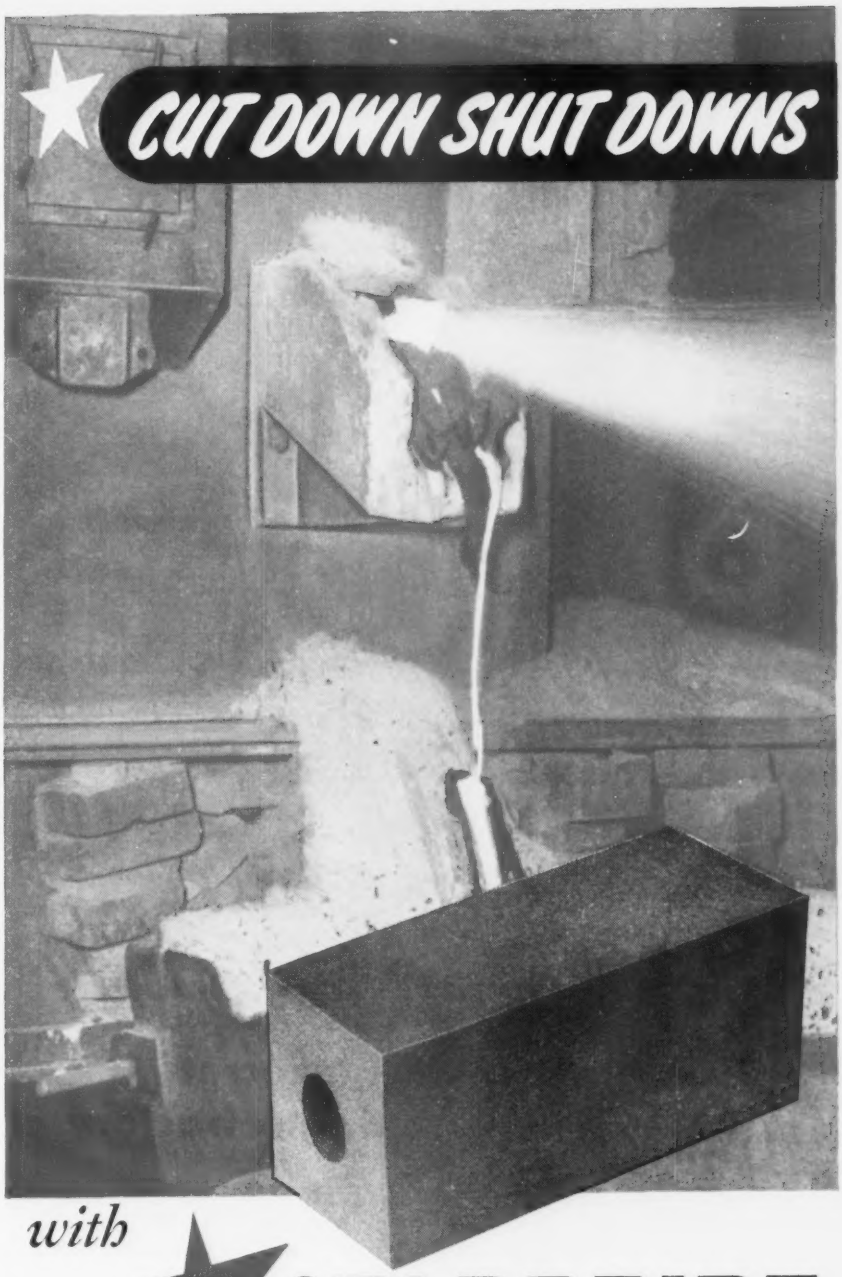
high as 8 in. in both cope and drag reportedly can be handled with the standard pressure pin assemblies supplied with the machine. Each platen contains 1955 holes to permit an infinite number of pressure pattern groupings. A resin tray deposits a pattern of bonding material, where required on the face of the shell. Maximum sealing pressure is exerted through the die springs on the botton of the pressure pins. Pressure cycle is automatically controlled.

For More Details Circle No. 18—Page 243

Pneumatic Vibrators: Vibron Division, Burgess-Sterbenz Corp., 3790 West 150th St., Cleveland 11, O. —Line of ⅝ and ¾-in. muffler-equipped, noiseless type pneumatic vibrators are designed to reduce processing time by vibrating small bins, chutes, hoppers and screens to prevent arching, clogging or sticking of inert bulk materials. Units deliver up to 5000 strokes per minute and operate on 30 to 140 psi line pressure. Size is 6¾-in. long. Weight is 2½ lb.

For More Details Circle No. 19—Page 243

Paint: General Paint Corp., Box 3474, Rincon Annex, San Francisco 19—Silicone resins and heat-



with ★STARRBIDE

CARBON-BONDED SLAG HOLE BLOCKS

Longer Cupola Runs because Starrbide Carbon-bonded slag hole blocks stay in use longer than ordinary blocks.

Reduced Erosion
from heat and slag flow to an amazing minimum.

Improved Flow Control
because runs are longer, more easily scheduled.

Higher Thermal Conductivity
rapidly dissipates heat.

Greater Production
because shutdowns are reduced.

AMERICAN REFRACTORIES & CRUCIBLE CORP. NORTH HAVEN CONNECTICUT

ALSO MAKERS OF FAMOUS STARRBIDE CARBON-BONDED CRUCIBLES, GRAPHITE CRUCIBLES AND SUPER REFRACTORIES.

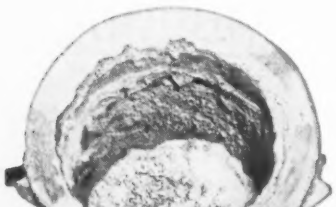
Line ladles for longer life

...Easily, Quickly

with J-M 3X Blazecrete®
the hydraulic-setting refractory

Easy to apply—3X Blazecrete—the 3000F refractory—is easily and quickly applied . . . mix with water like ordinary concrete, and slap-trowel to desired thickness. Air-cures without application of heat. Contains no harmful irritants . . . safe even for hand application. 3X Blazecrete is furnished as a dry mix, and may be stored indefinitely without deterioration.

Longer-lasting linings can be built with 3X Blazecrete because it is spall-resistant, withstands slagging action and has negligible shrinkage.



3X Blazecrete means cleaner forgings, has great ability to resist penetration and attack by molten metal.

Send for free brochure on Blazecrete (RC-28A) describing its properties and uses. To obtain a copy—as well as additional application details—write Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay Street, Toronto 1, Ontario.

Whether you gun it... *or slap-trowel it...*

JOHNS MANVILLE JM PRODUCTS **Johns-Manville BLAZECRETE**
BUILDS BETTER REFRACTORY LININGS

resistant pigments have been combined to form a high-heat-resistant paint finish that is flexible, hard, mar-resistant and durable. The finish can withstand temperatures to 1600°F as well as severe temperature changes without cracking, peeling or chipping. The paint also has the ability to resist attack by most acids, alkalies, salts, oils, solvents and some alcohols, according to the manufacturer. Can be applied by brush, spray or dip methods and is available in low or high gloss black or aluminum.

For More Details Circle No. 20—Page 243

Air-Powered Vise: Wilton Tool Mfg. Co., 925 Wrightwood Ave., Chicago 14, Ill.—Air-powered hydraulic

vise is designed to leave both hands free for work, thus speeding and simplifying grinding, cutting off, deburring, finishing, removing rust or scale, chamfering, and Brinell spotting operations. Compressed air, controlled by a foot pedal, is used to activate the vise. A hydraulic booster cylinder converts and multiplies air pressure, producing a vibration-proof grip. Vise can be adjusted to handle different work pieces by presetting the jaws to a different opening with a few turns of the vise handle.

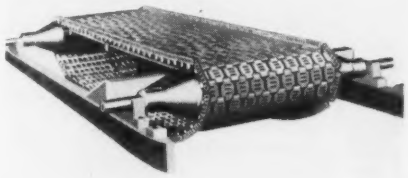
For More Details Circle No. 21—Page 243

Vibrators: Cleveland Vibrator Co., 2828 Clinton Ave., Cleveland 13, O.—By adding two new air vibrators to its line, company now has eight different sizes available. Of the new vibrators, the 1-in. model is a lightweight unit, and the 5 in. model is a heavy-duty long-stroke unit for larger bin applications where arcing, bridging and sticking conditions are extreme. All the vibrators operate on 25-100 psig continuous line pressure, with maximum efficiency obtained at 80 psig. Designed for continuous or intermittent operation, the vibrators can be used on bins containing

from one to several hundred tons of material. Vibrator, operating valve, automatic lubricator, mounting base plate, hose and couplings can be obtained in complete kit form.

For More Details Circle No. 22—Page 243

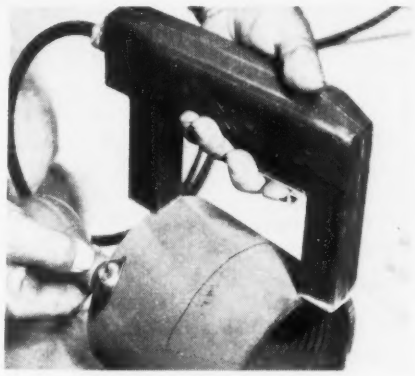
Open-Link Belt: Standard Alloy Co., 1679 Collamer Rd., Cleveland 10, O.—Open-type link conveyor belt for



industrial furnaces is adaptable to annealing, normalizing, stress relieving and draw furnaces where circulation of heat in the furnace is essential. Links are replaceable when necessary. Regular widths from 18 in. up to 60 in. are available and adaptable to comparatively long spans, operating in temperatures of 1800° F.

For More Details Circle No. 23—Page 243

Inspection Kit: Magnaflux Corp., 7300 Lawrence Ave., Chicago 31, Ill.—Light weight, portable magnetic particle inspection kit is designed for preventive maintenance inspection, weld inspection, and limited volume inspection of any magnetic part wherever surface cracks are suspect-

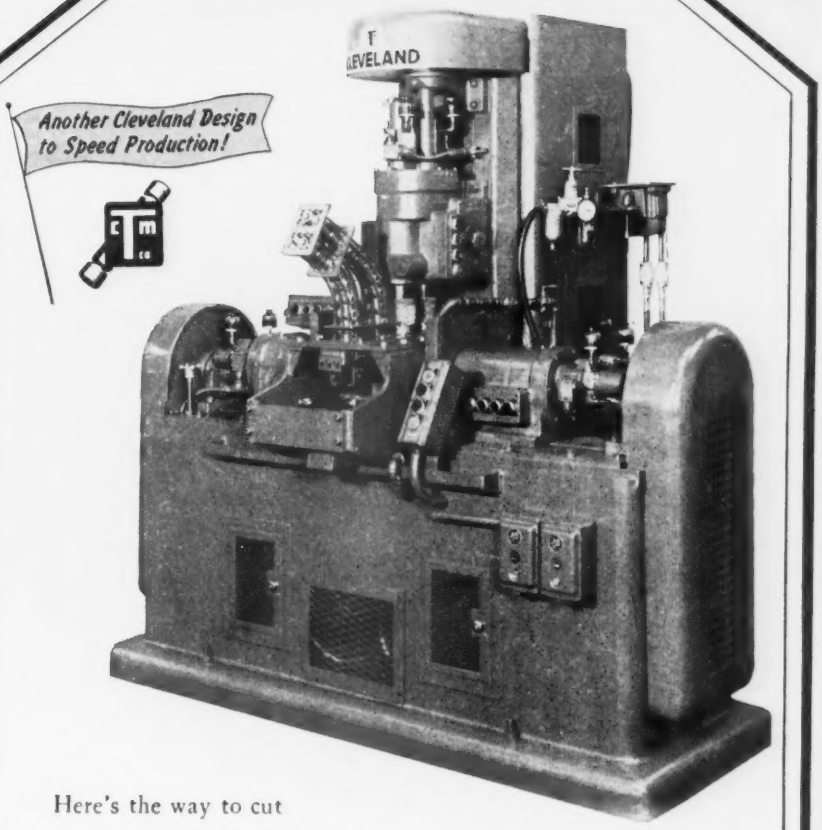


ed. Kit comes in metal carrying case and weighs less than 30 lb, complete. The yoke-type magnetizing and testing instrument weighs 7 lb. Magnaflux powder, powder bulbs, 100-ft cord, and operating instructions complete the kit. It draws 6 amps from any 110-v ac line.

For More Details Circle No. 24—Page 243

Roof Coating: Colonial Refining & Chemical Co., NBC Bldg., Cleveland 14, O.—Liquid aluminum-asbestos roofing is designed for use on buildings where an air-conditioning installation is prohibitive. When applied, rooms under the roof are immediately cooled until temperature approaches temperature in the shade,

1308 tee fittings per hour!



Here's the way to cut costs on tee fittings! This Model FT-1 will tap 1308 pieces ½" - 14 per hour at 100% efficiency. Also handles ¾" and 1" sizes. All spindles have their own lead screw feed—assuring the precision for which Cleveland Fitting Machines are famous. Produced parts are square and within the required tolerances. Set-up and change-over time is reduced and tap life increased up to 25%. For greater efficiency this Model may be grouped in batteries of three with one operator to each battery.

If you make fittings of any size or type it will pay you to consult Cleveland engineers. Their know-how can save you money.

Write today for Catalog No. FD-104.

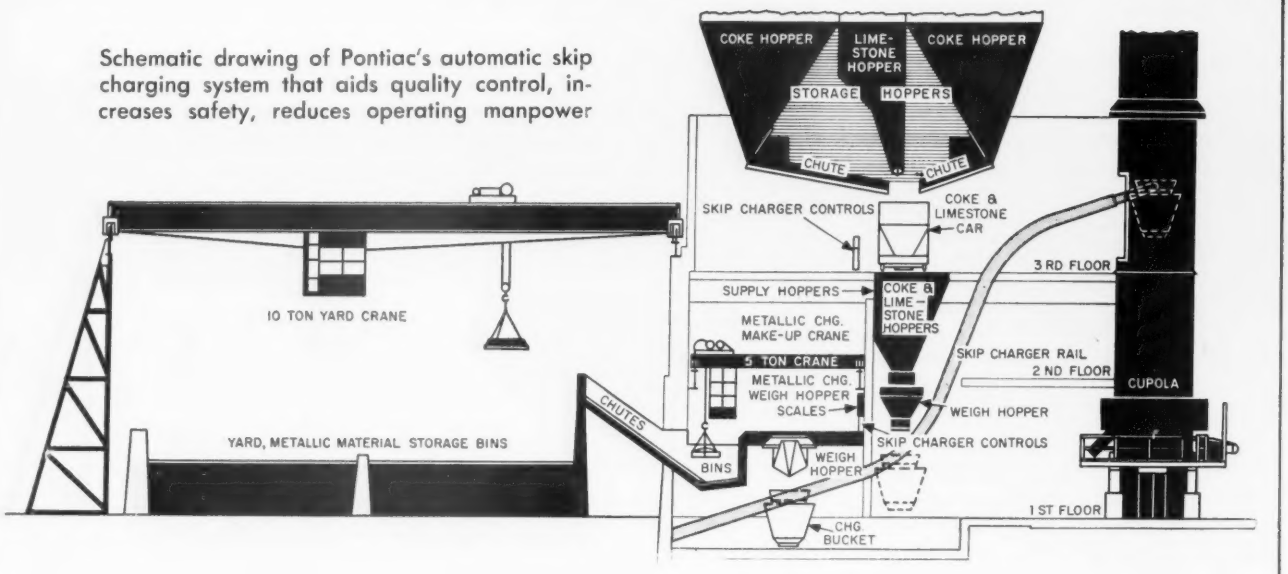
THE CLEVELAND TAPPING MACHINE CO.

A Subsidiary of AUTOMATIC STEEL PRODUCTS, INC.

CANTON 6, OHIO

For Better Tapping - - Faster!

CLEVELAND lead **fittings machines** screw



Schematic drawing of Pontiac's automatic skip charging system that aids quality control, increases safety, reduces operating manpower

Skip Charging Simplifies Cupola Operation

INSTALLATION of an automatic skip charging system at the Pontiac Motor Division's foundry, Pontiac, Mich., has eliminated a formerly unpleasant job of manually charging eight cupola furnaces in use at the company's gray iron foundry.

For each cupola the new system uses an "S"-shaped rail track upon which charging buckets are moved by cables through two loading positions and up into the furnaces for discharge. This method has replaced a former system of moving the buckets to loading positions by truck and hoisting them by crane to cupola mouths.

Where the old method required 10 to 15 hand-loaded buckets to be kept in reserve at all times, the speed of the skip charging system allows the buckets to be charged when needed. Additional advantages are that fewer men are required to make the system function, safety of the work is increased appreciably, and quality control of the gray iron is simplified.

according to the manufacturer. Material is applied in a one-coat brush application. The aluminum reflects the infra-red rays of the sun, hence the reason for cooler inside temperatures.

For More Details Circle No. 25—Page 243

All-Purpose Conveyor: Farnco Sales Co., 6713-15 Formosa Way, Pittsburgh 8, Pa.—Lightweight, aluminum conveyor features cleanout and scraper at both tail and head ends, full length shock plates, sealed-in antifriction bearings, aluminum alloy box construction truss, and cross braces with antifriction troughing carriers. Designed for portability, the unit can be powered by an electric, gas or air motor. Wheel assembly can be removed for tight clearances. Three lengths are available—12, 16 and 20 ft—with a standard 16-in. width.

For More Details Circle No. 26—Page 243

Safety Spectacle: United States Safety Service Co., 1215 McGee St., Kansas City, Mo.—Lightweight, metal-framed, safety spectacle features noncorrosive, nickel-silver frame with polythene nose pads that fit nose contours and distribute weight lightly without pressing or gouging, according to the manufacturer. Plastic lenses assertedly have increased scratch resistance with a surface hardness approaching that of hardened glass. Hardened glass lenses also are provided.

For More Details Circle No. 27—Page 243

Air Control Valve: Ross Operating Valve Co., 120 East Golden Gate, Dept 2101, Detroit 3, Mich.—Air control valve is said to provide an exceptional degree of safety in press operation by "sensing" valve malfunctioning and shutting itself off when any component does not operate normally. Valve is an alternating current solenoid, pilot-operated, three-way model, with a single inlet port, a single cylinder or out port, and two interconnected exhaust ports. Main valve pressures range from 30 to 125 psig air, with pilot pressure of 40-125 psig air. Maximum temperature is 175° F. Operating voltage, plus or minus 10 per cent, rated 115 v. Weight is 14 lb and inlet pipe size ¾-in.

For More Details Circle No. 28—Page 243

Centrifugal Blower: U. S. Hoffman Machinery Corp., Air Appliance Division, 105 Fourth Ave., New York, N. Y.—Large volume standard production centrifugal blower uses a combination of three interchangeable impellers. It can be factory assembled to deliver any air volume between 2000 and 9000 cfm, with pressures ranging from 1 to 9 lb psig, or vacuum from 2 to 12 in. Hg. There are no internal wearing parts. Rotor and housing are designed to permit free air flow, thus reducing air noise.

For More Details Circle No. 29—Page 243

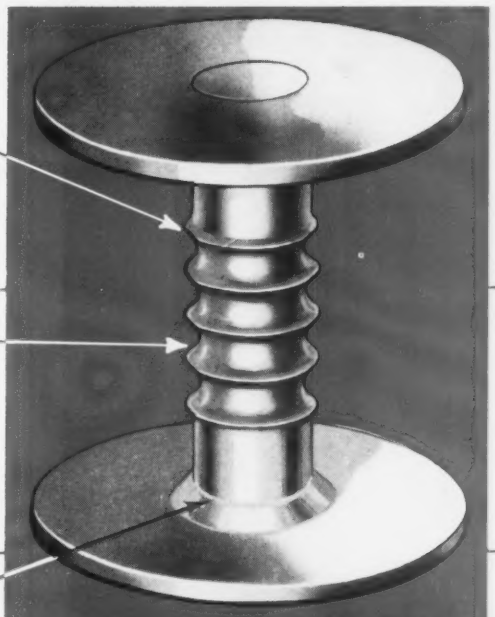
Drive Take-up: Lamson Corp., Syracuse, N. Y.—Combination medium-duty center drive and take-up can be combined with roller gravity conveyors to form belt or live roll

(*Continued on page* 250)

GET YOUR CASTINGS RIGHT IN THE GROOVE

with *fine* FANNER DOUBLE HEAD GROOVESTEM CHAPLETS

finest chaplets ever developed to insure maximum fusion and core support because of these features . . .



1 FEATHEREDGE FUSION RINGS

Knife-like edges on the multiple rings heat instantaneously to fusion temperature — completely sealing chaplet into casting and eliminating leakers.

2 COMPLETE CONTACT RADIUS GROOVES

Molten metal rolls up solidly against the rounded bases of the radius grooves. Greater chaplet area contact results in maximum fusion. No sharp angles to trap gases or weaken stem strength.

3 COUNTERSUNK SHOULDERS

Heavy, tapered shoulders provide solid support to plates — allow full contact with molten metal. No sharp angles to create voids usually formed under heads of ordinary chaplets.

4 FULL STRENGTH

Reinforced construction at all required points provides maximum support without use of extra heavy metal.

5 TIN COATING

The surest protection against rust, as well as aid to fusion. Readily alloys with iron and steel, lowering melting point and improving fusion. Also available in pure copper.

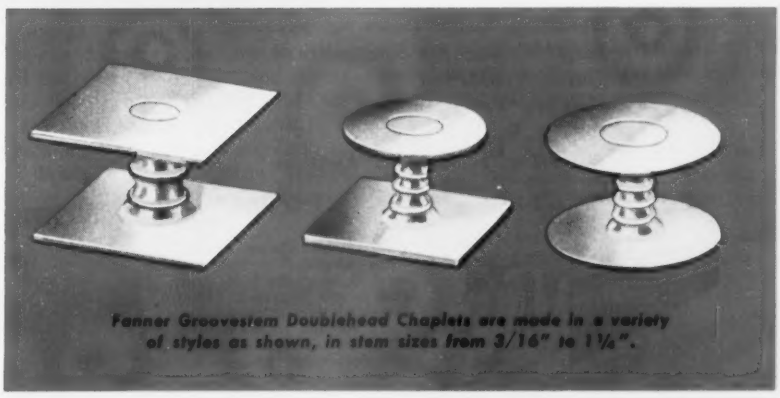
6 PRECISION TOLERANCES

Held to ± .002 on most sizes, Fanner reputation for accuracy is unequalled.

BETTER CASTINGS because of

1. Assured core support
2. Maximum fusion
3. Freedom from leakers
4. Accurate wall thicknesses

• If you haven't investigated the advantages of fine FANNER Groovestem Chaplets for your work, by all means do so now. Foundries everywhere have found that this design has made a tremendous difference in the production of better quality castings because of its extra-strong core support and completeness of fusion. Firms doing critical casting work have confirmed its superiority by standardizing on Fanner Groovestem Chaplets. Get complete information by writing for samples and prices now!



Fanner Groovestem Doublehead Chaplets are made in a variety of styles as shown, in stem sizes from 3/16" to 1¼".

THE FANNER MANUFACTURING CO.

BROOKSIDE PARK CLEVELAND 9, OHIO

Designers and Manufacturers of Fine Fanner Chaplets and Chills

FOR THE FIRST TIME . . .

A small-foundry kiln type oven with custom features at this standard model low price . . .

This new MOCO Oven is perfect for baking, heating, drying, and curing. It is specially designed and engineered to include many of the features made famous in MOCO's custom-built ovens.

All these features are included in one amazingly low price:

- Operating Temperatures up to 500° F.
- Large Volume Air Recirculation
- Forced Ventilation
- Uniform Temperatures
- Quality Safety Equipment
- Automatic Temperature Controls

GET ALL THE FACTS TODAY

MICHIGAN OVEN COMPANY MOCO DETROIT MICHIGAN

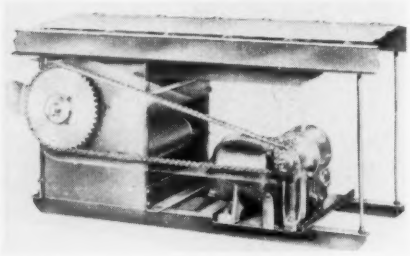
The model shown has a work chamber 4 ft. wide by 4 ft. deep by 6 ft. high and is gas operated. Other Standard sizes are available. For further information, write for this comprehensive folder today.

MICHIGAN OVEN COMPANY

419 BRAINARD · DETROIT 1, MICHIGAN

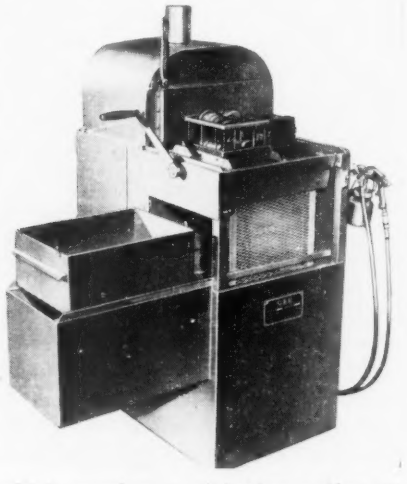
(*Continued from page* 248)

conveyors. Unit is made in widths of 12 to 24 in. in 2-in. increments. Widths wider than 24-in. can be supplied on request. Gear head motors of ½ to 1 hp are furnished as standard with a maximum effective pull of 300 lb. Unit is designed to use regular three-ply belting.



For More Details Circle No. 30—Page 243

Shell and Core Machine: Metco Processing Corp., 1293 East Cross St., Ypsilanti, Mich., and Gladwin Corp., 14560 Eureka, Wyandotte, Mich.—Shell mold and coremaking machine uses any metal pattern that will not disintegrate at the desired operating temperature. Machine also is said to make shells and cores simultaneously as long as the patterns and coreboxes fit under the dump box. Shell size is controlled to the exact size of the mold. Operator can repair visible shell defects while they are on the machine. One model can accommodate any pattern up to 14 x 18 in. which requires a stripping action up to 6 in. It also can take a corebox with a base size up to 14 x 18 in., and a height of 6 in. above the rollover frame. Another model accommodates a pattern up to 20 x 30 in., with a stripping action up to 6 in.



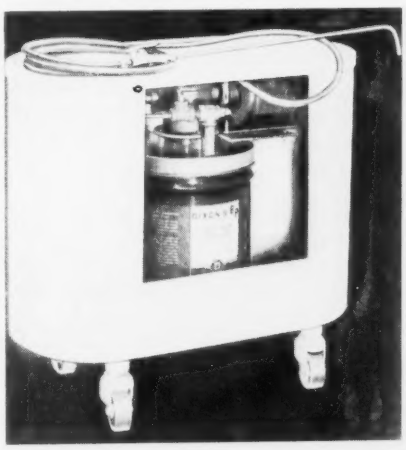
For More Details Circle No. 31—Page 243

Purifier: V. D. Anderson Co., 1935 West 96th St., Cleveland 2, O.—Purifier that removes dirt and moisture by a combination centrifugal and baffle type separating element inside a forged body is said to require no maintenance. Unit is de-

signed for use with all pneumatic equipment since it separates any dirt or moisture that might wear out or corrode an air tool. It also eliminates the need to blow down an air line before using air tools. Made in a wide range of sizes for installation in piping when used in a vertical position and made in 1 through 2-in. sizes for horizontal installation.

For More Details Circle No. 32—Page 243

Chain Lubricator: R. G. White Engineering Co., 1338 Atlantic Ave., Brooklyn 16, N. Y.—Colloidal graphite



lubrication of all movable parts subject to temperatures up to 1000° F in industrial ovens is possible with oven chain lubricator. Thin extension applicator tube lubricates into hard-to-get-at parts and protects the oiler from contact with any radiation or hot metal. Unit fits over any standard 5-gal pail of lubricant and consists of aluminum extension applicator, ¼-hp motor, pump with hardened steel gears designed for graphite mixtures, steel-vaned agitator, 9 ft of hose, and a pressure adjusting valve with a range of 0-50 psi.

For More Details Circle No. 33—Page 243

Separator: Devilbiss Co., 300 Phillips Ave., Toledo 1, O.—Oil and moisture separator for cleaning of compressed air is a high-capacity 50 cfm unit with power regulation assuring steady uniform air delivery. If regulation of air is not desired, the oil and moisture separator alone is available. The combination unit will regulate pressures up to 135 psi from an air line carrying pressures up to 250 psi. Unit has a length of 15 in., width of 8½ in. when equipped with valves, and a depth of 8½ in.

For More Details Circle No. 34—Page 243

Mobile Service Station: Prime-Mover Co., Muscatine, Iowa—Small, self-powered, self-propelled service station for maintenance of heavy equipment is equipped with compressor, air tank, space for three 100-lb drums, tool trays, service hoses and

STANDARD HAS ENGINEERED AND BUILT FOUNDRY CONVEYORS SINCE 1906

Standard Conveyor Company has an experience record of almost a half century — engineering and building foundry conveyors. On any foundry handling problem Standard can aid you to select and install conveyors that will give you reduced handling time — uninterrupted smooth flow in production — careful safe handling of light or heavy molds — better storage facilities — and help conserve and better utilize existing foundry space.

Available in a wide range of sizes, weights and types — equipped with shielded bearings expressly designed for severe foundry service — to suit a wide variety of foundry applications. Whatever your specific need, Standard is qualified by experience and facilities to recommend and furnish the right type of conveyors.

Send for Standard's special catalog "Conveyors for Foundries" — a valuable reference book illustrating and describing conveyor installations in leading foundries.

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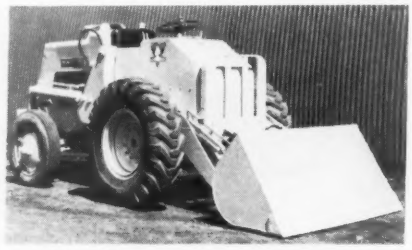
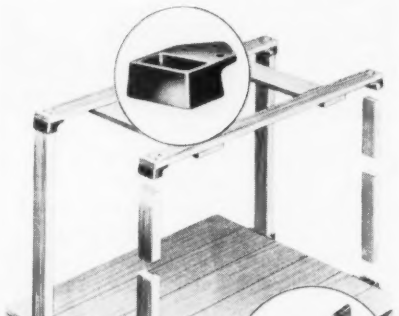
lubricant pumps. Unit is 31 in. wide for ease of movement between machinery and close to equipment. Alemite equipment is used for handling motor oils, gear lubricants and pressure gun lubricants. An air delivery hose with tire chuck also is included.
For More Details Circle No. 35—Page 243

Front End Loader: Contracters Machinery Co., P. O. Box 191, Batavia, N. Y.—A ¾-cu-yd struck measure loader uses no clutches but embodies a direct drive from the engine, through a torque converter coupling to the transmission. Four working speeds are provided in addition to a high-speed range for traveling. A gear-type reversing mechanism provides the five gear range for either forward or reverse travel. The unit loads over the drive wheels and the load weight is used to provide extra traction.
For More Details Circle No. 36—Page 243



Face Shield: Davis Safety Division, Davis Emergency Equipment Co., 45 Halleck St., Newark 4, N. J. —Line of face shield and welding helmet protective cap combinations are secured firmly to the cap by a patented clip, held in tension under the rim of the cap by an adjustable neoprene band which crosses the top of the cap. Face shield combinations have a clear plastic window, in various sizes and thicknesses, and a fibre spark deflector, held in tension against the window to prevent entry of sparks or dirt.
For More Details Circle No. 37—Page 243

Pallet Hardware: Paltier Corp., 1701 Kentucky St., Michigan City, Ind.—Socket type hardware assembles to any standard pallet and permits users to build their own stacking pallets. Each pallet with hardware and 2 x 4-in. uprights is designed to carry a load of 1500 lb safely in a tier of three high (4500 lb), with 48-in. posts. Additional load capacity can be attained by using 3 x 4-in. posts. Company offers iron hardware only, hardware plus uprights and cross bars, or complete stacking assembly plus pallets.
For More Details Circle No. 38—Page 243



Fire Truck: John Bean Division, Food Machinery & Chemical Corp., Dept. IF, Lansing 4, Mich.—High-pressure fog method of fighting fires has been incorporated into an industrial fire truck with size and maneuverability engineered for negotiating factory aisles. Using one-tenth the volume of water discharged under ordinary pressures, the apparatus cools, smothers and isolates flames in seconds, according to the manufacturer. It is claimed to be effective against fires in oil,

Need core plates that SPEED PRODUCTION?

. . . then use TRANSITE CORE PLATES that are light-weight and easy to handle

You'll find two important reasons why Transite* Core Plates mean faster production: First, core makers can handle more plates with fewer trips. Second, Transite Core Plates are easier to clean . . . core wash, sand, etc., do not adhere to them as readily as to other core plate materials.

Here are more *reasons why you can profit by using Transite Core Plates:*

They give long service—Made of tough, fibrous asbestos and cement, Transite Core Plates resist shock and corrosion—will not crack or break easily—require little, if any servicing. *Performance records of 8, 10 and 12 years are not unusual.*

They maintain accuracy — Transite Core Plates stay smooth through long, hard service. Foundrymen who have used them for years report minimum warpage.

For cores of large mass and small surface area, perforated Transite Core Plates are also available to eliminate green cores and reduce baking time. For full details write Johns-Manville, Box 60, New York 16, N. Y.

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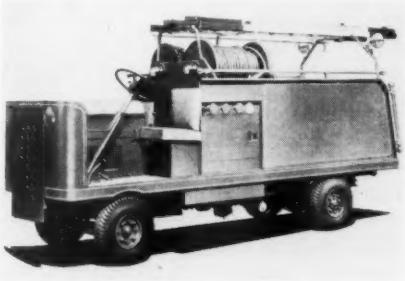
Johns-Manville TRANSITE CORE PLATES

Made of Asbestos

gasoline, lacquers, solvents and all other flammable liquids and materials, except magnesium. Truck's



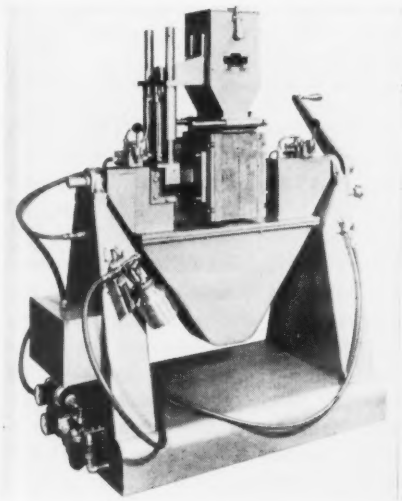
300-gallon tank holds enough water for 20 minutes of normal fire fighting and is equipped to pump water from plant water lines or from straight draft sources as a pond or cistern. Only 48 in. wide, 140 in. long and 79 in. high, the truck has a 76-in. wheelbase and a turning radius of less than 15 ft.

For More Details Circle No. 39—Page 243

Alloy Liners: Pangborn Corp., 1400 Pangborn Blvd., Hagerstown, Md.—Alloy liners for protection of parts subject to abrasive action in airless blast cleaning units are heat treated, almost diamond hard, have a polished surface and are claimed to give extraordinary wear resistance. In addition, the smooth, hard surface is said to reduce shot turbulence, minimize shot breakdown from striking the plates, and maintain a constant deflection pattern of the shot.

For More Details Circle No. 40—Page 243

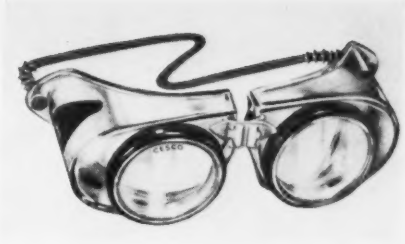
Shell Core Machine: Shalco Engineering Corp., Palo Alto, Calif., and Shallway Engineering Corp., Connellsville, Pa.—Shell core machine that produces shell cores for use with green sand, permanent molds and



shell molds reportedly delivers a cured shell core every 30 to 50 seconds, depending upon core size and wall thickness. Machine is available for either gravity investment, with sand hopper and shutter, or for blown cores, with a blow head. Manufacturer claims most existing corebox can be used with the machine. Built-in heater plates complete the curing process on the machine. Fully automatic corebox temperature control is provided by a thermostat and magnetic contactor.

For More Details Circle No. 41—Page 243

Goggles: Chicago Eye Shield Co., 2300 West Warren Blvd., Chicago 12, Ill. — Lightweight plastic welders' helpers goggles feature an ultra-violet ray inhibitor which is said to



overcome fogging, crazing and brittleness which commonly result when transparent plastics are subjected to ultraviolet rays. Designed to be worn as flash goggles by welders' helpers or by spot welders, the goggles are

Save TIME. MONEY. LABOR
USE BUCKEYE SILICA FIRESTONE
CUPOLA BLOCKS
CUPOLA LINERS
SPLIT ROCK LININGS
Here's Important
Profitable
Refractory Information
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FOR quick, easy-to-read information about Buckeye Silica Firestone for all types of foundry installations, write us today for your copy of Bulletin 63. It provides a complete listing of cupola blocks and liners, slag hole blocks, rock patching and other forms of Buckeye Silica Firestone.
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LIFT-O-KRANE is rough, tough and ever-willin'

With this versatile LIFT-O-KRANE you can do the impossible . . . Use it as a Crane Truck, a Fork Lift Truck and/or as a Ram Truck.*

Silent Hoist heavy duty LIFT-O-KRANE is designed to make the most difficult job "all in the day's work." Take, for example, one of the 5 ton capacity LIFT-O-KRANES in daily duty at SUN OIL COMPANY, Marcus Hook (Pa.) Refinery. Here it is shown easily handling a bulky, unbalanced, heavy-to-handle accumulator tank. Its next job may be dragging lengths of pipe lines and locating them properly in ditches . . . then lifting and moving giant valves and heat exchangers and installing them in their proper place in the refinery lines. According to one Sun Oil executive, LIFT-O-KRANES lift and serve, day after day, with efficiency and dispatch, and *replace entirely any need for regular cranes.*

***3-IN-1 MACHINE:** With integrated BOOM Attachment—handle Hook Loads. With RAM Attachment—handle Hollow-Center Loads. With its FORK Tines—handle Timber, Machinery, etc.*

You, too, should investigate the tough, maintenance-free service of LIFT-O-KRANE Combination Machine . . . and LIFTRUK Heavy-Duty Fork Truck . . . in 5 - 7½ - 10 - 15 ton capacities. Send for Bulletin 77.

SILENT HOIST & CRANE CO.
Pioneers of Heavy Duty Materials Handling Equipment
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"FALLS BRAND" ALLOYS
AMERICA'S LARGEST PRODUCERS OF ALLOYS

"FALLS" FLUX "B"
for
BRASS AND BRONZE

USE: Separates dross from molten metal, reducing rejections and scrap caused by dirty metal, and thus increasing metal yield about 3%.

FORM: Dry, white powder. Does not absorb moisture. Does not smoke, fume or smell. Can readily be handled with bare hands without burning the skin.

APPLICATION: Cleans, fluxes and removes oxides and non-metallic impurities from all grades of bronze. A "must" for melting of brass or bronze.

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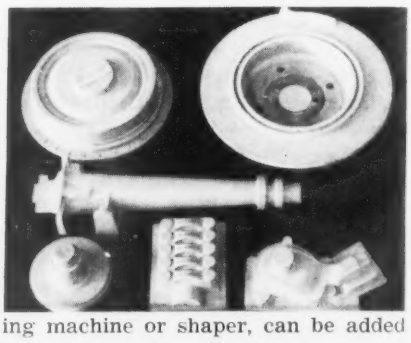
Smelting & Refining Division
BUFFALO 23, NEW YORK

supplied with round rubber headband or with flat elastic or rubber headband. Made in cover goggle style, they are large enough to be worn over personal glasses. Lenses furnished in green only.

For More Details Circle No. 42—Page 243

Plastic Patterns: Plastic Tool Co. of America, P. O. Box 108, Eaton Rapids, Mich.—Company uses nonshrink plastics combined with fibre glass cloth to reproduce patterns from master patterns of wood, plaster, or metal. Duplications are claimed to be within 0.003-in. of original with a rated tensile strength of 40,000-50,000 lb psi. No additional finishing is necessary. Patterns can be machined on lathe, mill-



ing machine or shaper, can be added to, reduced by machining, or repaired by use of a patching kit available from the firm.

For More Details Circle No. 43—Page 243

Wetting Agent: Magnus Chemical Co., South Ave., Garwood, N. J. —Wetting agent with sudsing properties causes solution to bubble profusely when used in water-testing castings for porosity. Material is used at about one ounce per gallon of water. When castings are immersed in the solution and air is introduced into their interiors with all openings plugged, faulty castings are said to show up immediately, and even the smallest pinholes can be detected.

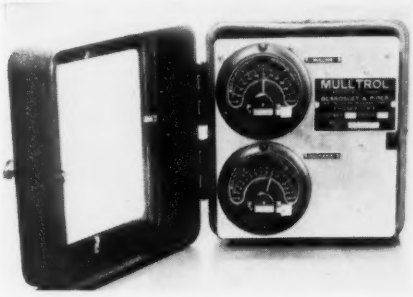
For More Details Circle No. 44—Page 243

Conveyor Belt Insert: B. F. Goodrich Co., Industrial Products Division, Akron, O.—Ribbons of high-tensile steel wire when inserted at intervals up to 3 feet in a new type rubber conveyor belt act as barriers against rips which occur in severe service when sharp objects penetrate the belt, become jammed and slice the belt. Developed initially for foundry shakeout service, the construction is available in a variety of belts, including all types of hot material conveyor belts.

For More Details Circle No. 45—Page 243

Mulling Cycle Timer: Beardsley & Piper Division, Pettibone Mulliken Corp., 2424 North Cicero Ave., Chi-

cago 39, Ill.—Two mulling cycle timers reportedly provide accurate control of overall mulling time and



of discharge time to assure a high degree of uniformity in foundry sand mixes to required physical properties. The automatic cycle control is recommended where complete control of all phases of the mulling cycle is desired. Where control of the overall cycle and of sand discharge will suffice, use of the simplified timer is recommended.

For More Details Circle No. 46—Page 243

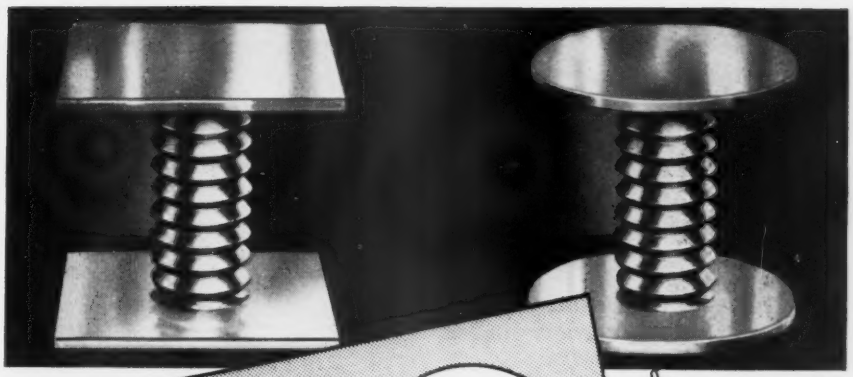
Pattern Glue: Kindt-Collins Co., 12563 Elmwood Ave., Cleveland, O. —White glue for pattern shops and general commercial applications is said to embody high standards of performance, stability and long life. Glue contains a high solid content, remains stable when stored for long periods and, according to the manufacturer, is not affected by freezing. It is packaged in one-gallon flexible plastic bags packed in gallon cans, in plastic-lined 5-gal cans or 54-gal drums. Individual plastic dispenser bottles are available to order.

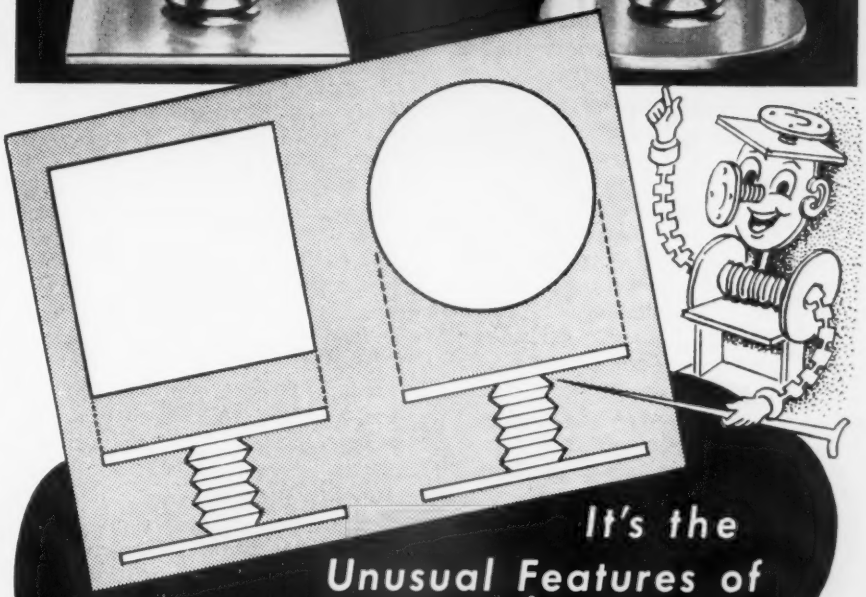
For More Details Circle No. 47—Page 243

Polishing Machine: Syntron Co., Homer City, Pa.—Machine provides a method for lapping and polishing

metallurgical samples, metallic sealing ring faces, and other metal parts requiring a highly polished surface. Machine handles many samples in one operation and produces "scratch free" material for electron microscope or brush analyzer examination. Models with bowl sizes from 5 to 24 in. can be supplied. Units are equipped with rubber feet for placement on any rigid, flat surface, such as a table top.

For More Details Circle No. 48—Page 243





It's the
Unusual Features of
Milwaukee
CHAPLETS
that Insure Instant Fusing
in any Casting

It's the sharply cut "thread stem" design that insures instant fusing. Metal melts at the edges first, that's why the sharp edges "burn in" quickly and completely to insure instant fusing which results in freedom from leakers. As the fusing cycle slows up through the base of the thread and into the stem itself, there is ample time for adequate and proper core support. Here is a design where fusion takes place at exactly the right speed to give you both instant fusion plus proper core support.

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NEW ARC FURNACE CONTROL

Cuts Operating Time and Costs

Following experimental work on the control, it was field tested under actual production conditions at the Kensington Steel Co., Chicago

VITAL key to successful, lower cost melting in electric furnaces is the speed and accuracy with which electrodes can be moved up or down. This phase of arc furnace operation has attracted more industry attention than any other.

Newest development in this field is the Hydro-arc furnace control developed by Whiting Corp., Harvey, Ill. Comparative laboratory testing of the unit in use showed: 1. Reduction in operating cost. 2. Action response time of less than 1/20th second from bus to electrode. 3. Reduced maintenance. 4. Reduced line surges. 5. Improved arc, requiring less reactance and producing a higher power factor.

Field tests conducted at Kensington Steel Co., Chicago, over a 6-month period revealed that during an average 30-day operation the new control, compared with previous methods, reduced current consumption 5.7 per cent, from 520 kwh per ton of melt to 490 kwh per ton. The number and intensity of current deviations also was reduced. Maintenance requirements were less, and the transformer ran 10 to 15 degrees cooler. A 12 per cent drop in refractory costs was attributed to the increased response speed provided by the control. Electrode consumption remained the same.

Trial runs at capacity throughout an 8-hr day showed that the new control reduced tap-to-tap time on 4-ton heats to 95 minutes as compared with the former record of 114 minutes.

How It Works—Electrode motors in the system do not reverse. They run continuously in one direction and regulate at or near rated speed instead of from a standstill. These motors are energized directly from the furnace bus, eliminating special generators and doing away with lag inherent in secondary current transformer systems.

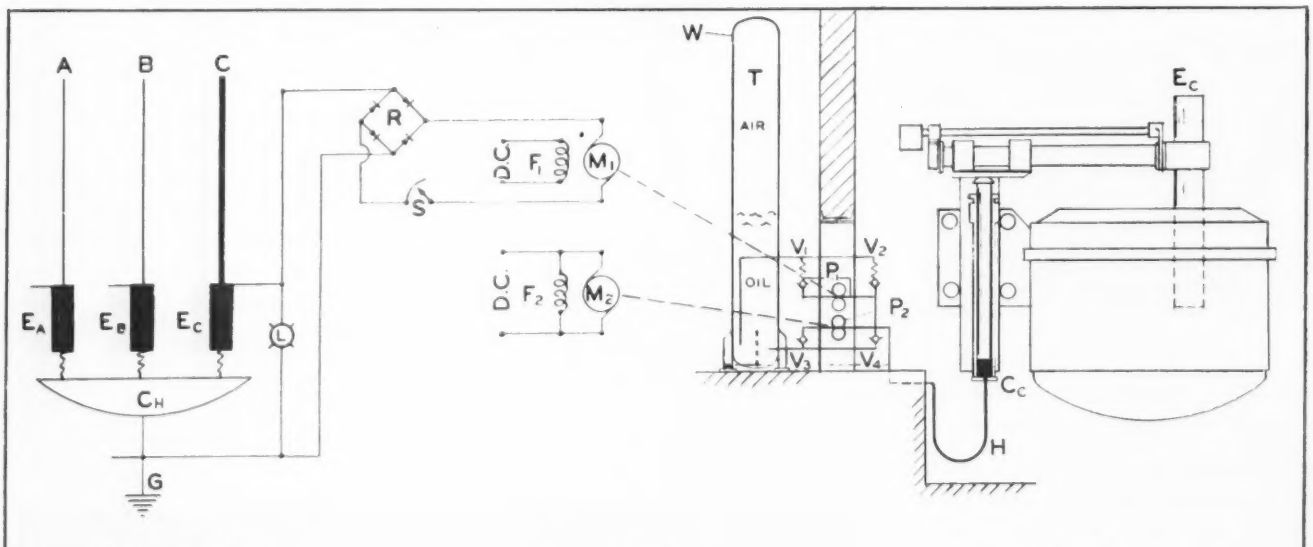
Actual movement of the electrodes is performed by an air-counterbalanced hydraulic drive. Motor M_2 (see sketch) is connected directly to pump P_2 which forces liquid from tank T at a constant rate to cylinder C_c. Motor M_1 is connected directly to pump P_1 which takes liquid away from cylinder C_c, returning it to tank T. Pumps are of the positive displacement type.

When the two motors are running at the same speed, P_1 returns entire output of pump P_2 and the electrode does not move. When motor M_1 slows down or speeds up, the difference in output of the pumps either raises or lowers the electrodes.

Thus, electrode action is controlled entirely by M_1. In turn, the speed of this motor is controlled by the amount the arc is "off balance." The constant-speed motor, M_2, is the fixed standard against which this control regulates and nothing happening in the furnace or in the furnace power circuit can upset it.

The furnace operating panel is the same as a standard panel.

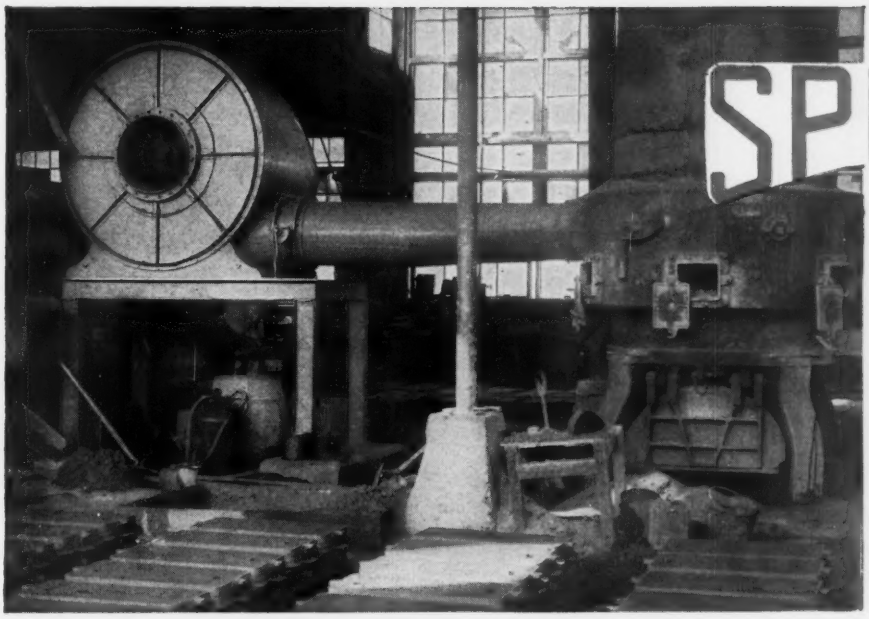
Sketch of the newly developed electric furnace control



A, B, C — A, B, C phase buses from transformer.
EA EB EC — Electrodes.
CH — Burden in furnace.
G — Ground.
L — Light on operator's panel.

R — Rectifier.
S — Electrode current adjusting rheostat.
D.C. — Direct current supply.
M1, M2 — Electrode motors.
F1, F2 — Fields.

W — Air supply.
T — Air-oil tank.
V1, V2, V3, V4 — Valve cluster.
P1, P2 — Electrode pumps.
H — Anchor coupling hose.
CC — Cylinder.



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KEEP
MELTS
M-O-V-I-N-G
with

SPENCER TURBO-COMPRESSORS

SPENCER HARTFORD

FOUNDRY EQUIPMENT MEMBER FEMA MANUFACTURERS ASSOCIATION INC.

A good, dependable air supply is the heart of any foundry operation. Once the amount of air for a given charge is determined, the Spencer Turbo will continue to provide the desired amount, day in and day out for years without interruption.

This dependability is built-in. With wide clearances, only two bearings to grease and an all-metal bridge-like construction, there is little that can go wrong even in the most severe and prolonged service.

Spencer Turbos are particularly noted also for their compact, light weight construction and comparatively quiet operation. They can be mounted anywhere—overhead, or on the floor without special foundations.

The control may be manual, by means of a calibrated ammeter and blast gate, or complete automatic air-weight control with recording charts may be used. Ask for the Spencer Foundry Bulletin No. 112.

7½ HP *Heavy Duty*

And for Foundry Housekeeping——

Spencer Industrial Portable Vacuum Cleaners are solving the housekeeping problem in all types of foundries, large and small. Periodic overhead cleaning, picking up molding sand and cleaning molds, patterns and finished castings are a few of the jobs that make Spencer Vacuum pay for itself in a few months. Bulletins on request.

THE SPENCER TURBINE COMPANY • HARTFORD 6, CONNECTICUT

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414 B

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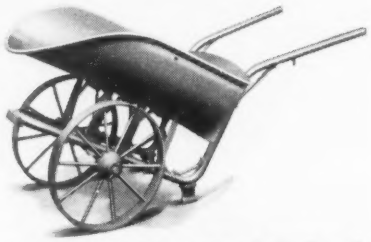

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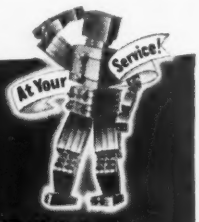

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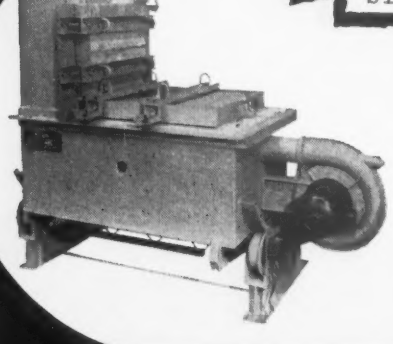

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Brass Foundry Problems

(*Continued from page* 131)

drawn gently over the surface. As removed from the furnace the metal will give a heavy white flare of burning zinc. This is too high a temperature for pouring. After a while the skimmer will only be followed by a faint white flare a half-inch or so above the metal; this is the pouring temperature to be used. The actual temperature will vary with the composition but the zinc flare takes care of this.

Not only should the pouring temperature be as low as possible, but the melting of the metal should be stopped as soon as the zinc flare becomes definite. Nothing is gained by stewing manganese bronze once it is molten. Also, much inconvenience due to zinc smoke is avoided. It is assumed that composition ingot has been used for this as for all cases discussed in this article. Manganese bronze especially requires two meltings, one by the ingot maker and one when the foundry makes the castings.

Castings Sometimes Fail

Another trouble occasionally, though not frequently, encountered, is when castings made of alpha/beta manganese bronze fail in use at a strain much below the rated capacity, particularly when the strain is in the nature of shock. The probable cause of such failure is that somewhere between 950 and 1100° F this metal is hot short. Above and below this the metal can be forged readily.

An example of this came to the writer's notice when a maganese bronze casting, having cored holes, had red-hot steel rivets inserted in the holes and driven home. The castings were returned to the foundry as defective because they broke at the point of riveting. The hot steel must have heated the cold casting to within the critical temperature of the bronze, in the area immediately in the vicinity of the holes. It is characteristic of this condition that if the metal is broken at say 1000° F and quenched in cold water, the fracture will appear as a brilliant golden yellow. A somewhat similar fracture is obtained when the zinc content is incorrect, but in this case the casting may be broken while cold. If the bar heated to 1000° F be cooled, it will break with the usual fracture and give the usual physical constants.

Trouble with manganese bronze having drossy areas exposed on machining is frequently due to the fact that not enough machining allowance was provided. A quarter of

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an inch is the least that should be called for in metal over 1 in. thick. In the long run, machining cost and loss of time will amount to much more than the extra metal provided.

A trouble sometimes associated with silicon bronze is the appearance of rust-colored powdery material upon machining. This occurs when the moisture content of the sand is too high or where there is a damp spot in a dry mold. The remedy is obvious.

Leaded-tin bronze castings are sometimes rejected because the machine shop reports that the metal is open or porous. The writer has traced some of these rejections to an improperly shaped or dull tool that has torn out the lead areas. While it is true that the lead particles are generally not more than 0.002-in. in diameter, or 0.008-in. at the most, the digging out of these particles leaves a metal that has all the appearance of being gassed. The proof as to the machining being at fault is provided by remachining the suspected area.

Speaking of machining, the writer was called in during the war to give an opinion on the peculiar mottled appearance of a large cylinder some 15 ft long. The machinist had advanced the idea that the metal was not properly mixed, hence the light and dark areas. The answer was that the particular form of the tool and rate of machining had exposed the crystal formation of the alloy. The proof of this was provided by rubbing several areas with a cloth until the pattern had been removed and then swabbing with a 10 per cent solution in water of ammonium persulphate, whereupon the pattern reappeared.

Hard Wear Alloy Recommended

Trouble is sometimes experienced when a metal is required that will withstand hard wear under conditions of abrasion, including road dust and like material. Frequently a high-tin bronze of 11 per cent tin content is recommended. When this fails to give satisfaction the question arises as to what alloy should be used. The writer would recommend, based on a lengthy and severe test, a silicon bronze having a silicon content of 1.5 per cent. The outstanding feature of this alloy is its resistance to shock, the Izod figure being 60 ft-lb.

The peening test is rarely called for but in the writer's opinion it is most informative and calls for metal of unusual quality. For instance, the pressing in of a copper alloy for driving bands for large shells calls for just such a test if the metal is to prove satisfactory for the purpose.

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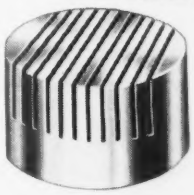

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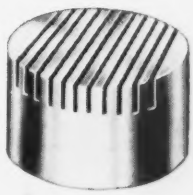

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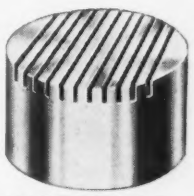

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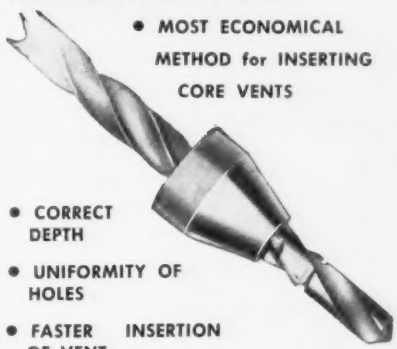

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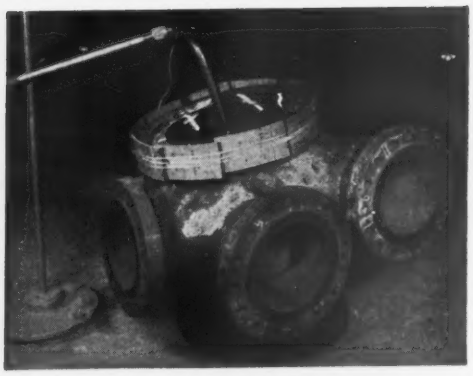

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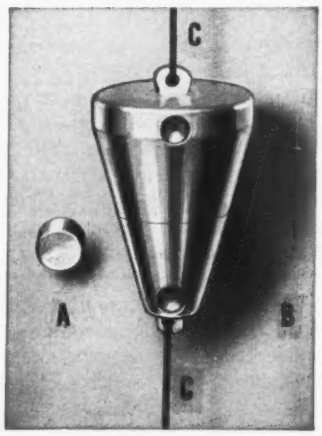

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Most copper alloys crack on the edges as the peening test progresses, even if they distort considerably. Silicon bronze of 1.5 per cent silicon content meets the peening test perfectly.

Some of the troubles with which the foundryman is confronted from time to time have been discussed and remedies given which, in the writer's experience, have proved effective. It is hoped that many readers will be provoked to pass on their experiences together with their methods of overcoming their troubles.

Acid Electric Steel

(*Continued from page* 125)

cent, the iron oxide dissolved in steel comes more and more under the influence of the partition coefficient:

$$L_{FeO} = [FeO] \div (FeO)$$

Above 0.10 per cent C the partition coefficient serves mainly to indicate that iron oxide is being supplied to the metal by the slag. Korber and Oelsen's[18] equation relating the partition coefficient to temperature is:

$$[FeO] \div (FeO) = L_{FeO} = 3.80 \times 10^{-5}\, t°C - 0.0512$$

This increase in the partition coefficient with the temperature would result in an increase in the iron oxide content of the bath if the iron oxide content of the slag remained constant.

As can be seen from the ternary diagram, the saturation values of silica also increase with temperature and silica is readily available from the hearth. Consequently, the anticipated increase in the iron oxide content of the steel caused by the rising temperature is not as great as would be expected because of the drop in iron oxide content of the slag.

To take a practical example—a heat of steel containing 0.09 per cent C is covered by a slag containing 45 per cent SiO_2, 40 per cent FeO and 15 per cent MnO in equilibrium with a silica hearth at 2820° F. The iron oxide content of the bath can be found from:

$$[FeO] \div (FeO) = [FeO] \div 40 = (3.80 \times 1550 \times 10^{-5}) - 0.0512 = 0.0078$$

so $FeO = 40 \times 0.0078 = 0.312$ per cent.

If the temperature is raised to 3000° F the slag picks up 10 per cent SiO_2, becoming 60 per cent SiO_2, 30 per cent FeO and 10 per cent MnO_2. The partition coefficient then becomes 0.0114. With the previous slag the iron oxide content of the steel at this temperature would be 0.456 per cent but as the iron oxide content of the slag has dropped it is only

$$30 \times 0.0114 = 0.342 \text{ per cent}$$

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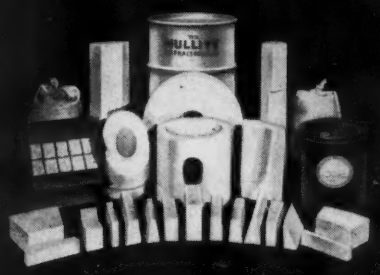

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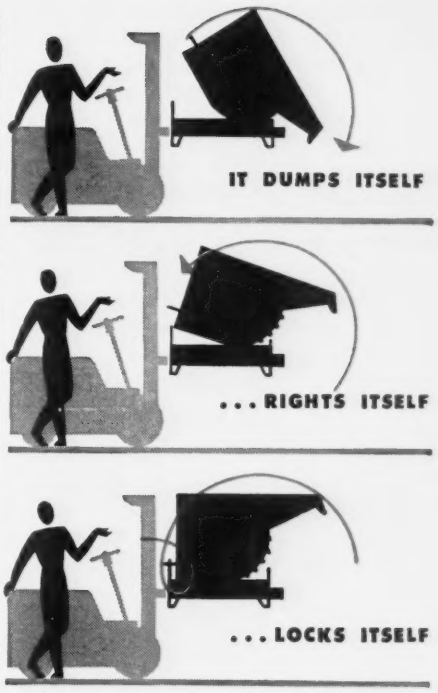
As has already been shown, lime will displace iron and manganese oxide from an acid slag. At a given temperature the substitution of lime for silica will increase the partition coefficient but its influence in reducing the amount of iron and manganese oxides in the slag more than compensates for this. Using extrapolated data from Fetters and Chipman's[19] ternary diagram showing the effect of slag composition on the partition coefficient and assuming an FeO:MnO ratio of 7:3, Table IV has been constructed showing the effects of adding lime to a natural acid slag at 2912° F.

To obtain the full benefit from lime additions in reducing the iron oxide content of the steel, they must be made while there is sufficient carbon in the bath to reduce the iron and manganese oxides released from the slag. When low carbon steels are required, the temperatures needed to cast them satisfactorily often lead to adverse conditions in the furnace due to the formation of very viscous slags. The iron oxide in solution in the steel rises with the temperature and eventually exceeds the equilibrium value for the silicon in the bath.

According to Darken's equation[20] $\log [Si][FeO]^2 = -43930/T - 20.24$ the relationship between dissolved iron oxide and silicon under silica-saturated slags has been calculated for various temperatures and is shown in Fig. 8. From this it can be seen that a steel containing 0.10 per cent C at 2912° F under a silica-saturated slag will contain 0.05 per cent Si in equilibrium with 0.12 per cent FeO. At this temperature a natural acid slag will have a silica content of 50 per cent plus approximately 35 per cent FeO and 15 per cent MnO.

The partition coefficient at this temperature is 0.0090 and the dissolved FeO 0.315 per cent (see Table IV). By using a synthetic slag with a lime-silica ratio of 1 to 2 the partition coefficient would give a dissolved iron oxide content of half that permitted by the silicon content of the bath (see Table IV—30 per cent lime, 63 per cent silica, $L_{FeO} = 0.0122$, FeO = 0.061). If the residual silicon falls below the 0.05 per cent usually encountered under such conditions, the benefits of the high lime slag are even more pronounced.

Slag Control—Acid electric furnace steelmaking is a rapid process and control of the slag by chemical analysis is out of the question. Fortunately, acid slags are very amenable to control by viscosity tests. In basic slag systems the temperature effect cannot be ignored nor can it



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be said that the slag viscosity varies with the degree of superheat above the liquidus. But acid electric furnace slags are more or less self-compensatory in this respect.

As the temperature rises the slag becomes capable of dissolving more silica and this is readily available from the hearth or banks. In so doing the liquidus temperature is raised, keeping the amount of superheat approximately constant. As the liquidus rises steeply, comparatively small amounts of silica are needed to compensate for appreciable rises in temperature which occur.

Standard equipment for viscosity tests is the Herty viscosimeter with either a 0.25-inch or 0.375-in. bore. Viscosity is closely related to the silica content as is shown in Fig. 9 (Herty viscosimeter with 0.375-in. bore). Provided that the lime content of the slag is low, viscosity is also related to its oxidizing power—iron and manganese oxide contents. For natural slags, therefore, with a small and controlled lime content, control by viscosimeter is quite adequate.

Sampling the bath for carbon and the slag for viscosity before clear melting enables control additions of pig iron, iron oxide or oxygen to be made. In this way each heat can be given a short, sharp boil after melting. This is a vital factor in removing dissolved gases as the bubbles of carbon monoxide, rising up through the steel, allow nitrogen and hydrogen to diffuse into them as well as more carbon monoxide.

A heat which melts out high in carbon, silicon and manganese can be started on before melting is complete, so saving time. A heat melting out soft can be adjusted by additions of pig iron or by dipping the electrodes, giving it enough carbon to ensure a reasonably brisk boil before deoxidation.

Finishing the heat under natural slags or slags containing up to 10 per cent lime, the following method can be adopted. The melter can estimate the manganese and silicon losses from the three relevant factors, time in the bath before tapping, temperature and slag composition.

With the rare metal thermocouple, temperature control is relatively simple. It also enables the finishing alloys to be added at a constant interval before tapping as the degree of superheat needed to melt unit quantity in unit time can be measured and the necessary allowance made. The viscosimeter gives a reliable indication of the oxidizing power of the slag and therefore the manganese recovery as is shown in Fig. 10.

Special Slags—Synthetic slags have been used by many operators for many purposes, but must justify themselves economically. For low carbon steels, below 0.10 per cent, a straight lime-silica slag in 1:2 ratio has proved to be quite satisfactory. As has been pointed out on theoretical grounds, such a slag keeps the dissolved iron oxide content of the bath within reasonable limits and also has a lower viscosity than a natural slag under similar conditions, thus avoiding unsatisfactory electrical conditions.

Making 1½ per cent manganese steel in the acid electric furnace is not easy particularly when stringent specifications have to be met. With natural slags the manganese yields are very variable and average about 40 per cent. A low viscosity, high surface tension slag has been developed. This synthetic slag is of the lime-silica-alumina type and not only increases the manganese yield to a consistent 60 per cent but improves the cleanliness and therefore the physical properties of the steel. It can also be used on grades containing less than 1 per cent manganese to

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improve the physical properties and increase the manganese yield from 50 to 75 per cent.

The practice is to ore or oxygen-blow down to the required carbon content, remove the natural slag, add the synthetic mix (sand, limestone chips and crushed firebrick) and finish the heat normally. On 1½ per cent manganese steels the tapping slag runs out at about 55 per cent SiO_2, 12 per cent Al_2O_3, 10 per cent CaO, 5 per cent FeO and 13 per cent MnO. X-ray patterns from such slags show them to be rhodonite plus glass.

Typical Heat Log—To illustrate the general course of a heat of steel and its control, a heat log is given in Table V. Slag viscosity readings were taken with an 0.375-in. bore Herty viscosimeter. The calculated constants K_1, K_2 and K_3 were taken from or interpolated from Table III and the deviation expressed as a percentage. As previously explained, equilibrium is not approached until the end of the carbon boil.

Carbon and silicon are the elements largely governing the dissolved iron oxide in the bath. The supply of iron oxide from the slag depends on the partition coefficient, the amount of iron oxide in the slag and on the physical conditions in the furnace, i.e., the boil. The amount of iron oxide in equilibrium with the residual silicon at the particular temperature is found from Fig. 8. Assuming a value of 1.12 for P_{co}, Schenck's figure of 80 for $P_{co}/[C] \cdot [FeO]$ gives a value of 0.014 for the [C][FeO] product. The dissolved iron oxide in equilibrium with the carbon is easily calculated as it is substantially independent of temperature.

It will be noticed that during the final 5 minutes of the heat the carbon, manganese and silicon were all falling. The manganese and silicon drop would be expected from the slag composition but the carbon drop in the presence of 0.40 per cent Si may appear surprising. However, referring to Fig. 8 again it can be seen that at this temperature 0.40 per cent Si permits a dissolved FeO content sufficient to lower the carbon content to 0.13 per cent. That is provided that sufficient time were allowed for the reaction to proceed to completion and that the supply of iron oxide from the slag was maintained.

Conclusion—In conclusion it can be said that the acid electric furnace is probably the most valuable steelmaking unit available to the steelfounder. Intelligent working and full use of available techniques of analysis and temperature measurement are necessary if the maximum economic output from the furnace is to be linked with the quality requirements. Further work on the physical chemistry of steelmaking in this type of furnace would assist the steelfounder to make even fuller use of it.

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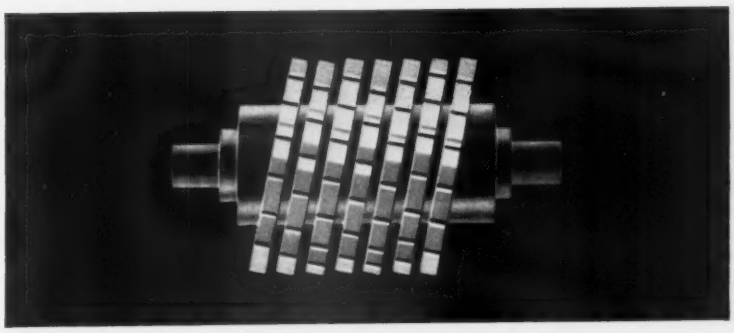

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Small Foundry Methods

(*Continued from page* 115)

such units daily, so that looking for such savings would hardly be worth the effort. His time should be devoted to larger savings in man-hours.

The study of methods has as its purpose a reduction in the over-all man-hours consumed in an operation and at the same time a reduction in the manual effort required. To do this in a small shop may require merely alert observation and trial and appraisal of results, not the use of a stopwatch. Particularly in a small organization, the discussion of ideas with personnel can be of great value. If ideas so gathered are credited to the originator, a fertile source of more suggestions is encouraged. In a great many cases operations can be improved with little or no capital expenditures.

In a shop employing five or six molders, for example, present practice may be for molders to help each other and to be their own servicemen. Having a service laborer for these men may seem to be an unnecessary expense. To determine the facts, the foundry owner or manager can set up a simple observational method which will give him the necessary information with a fair degree of accuracy.

This technique consists of his making a trip through his molding area about four times per day, not at regular or specified times, and recording the activity of each molder at each time. He might set up a simple card with such headings as Molding, Getting Sand, Getting Cores, Personal, etc. At each observation he merely notes how many men are involved under each heading at that instant, with no consideration of time. At the end of the accumulation of sufficient data, which may be a month, he adds the numbers under each heading and determines what percentage of the total can be applied to each activity. From this figure he can determine the percentages of time which are directly productive, indirectly productive and nonproductive.

It is evident that a strict schedule for observation could give distorted results since some men might have a similar pattern of activity each day. Therefore, random observation is desirable. The longer the period over which observations are made, the more dependable is the result.

From such observations, requiring relatively little time, the operator of a small foundry can determine the efficiency of his operations. If he finds that five molders are spending 20 per cent of their time in servicing themselves, he can justify employing a full-time laborer to service the molders, provided output is increased accordingly. Or he may do with one less molder and with one lower paid laborer. It may be seen that conconclusions drawn from such observations can be applied in many ways without excessive cost.

Working Conditions Important — Good housekeeping and safety are factors to be considered in an operation of any size. Proper conditions can result in reduced waste as well as in savings in valuable production time. An example might involve preparation of core and mold washes. In many foundries this operation is messy, wasteful and questionable from a quality standpoint. Equipment may consist of a can into which the various components of the wash are dumped, mixed with a stick and ladled out by molders and coremakers. Only a small investment is required to obtain an oil drum with one end open, set on a platform about a foot high and equipped with an electrical or air-driven mixer to mix the components and a spigot at the bottom of the drum to service the molders and coremakers. A pocket hydrometer and measuring cans complete the equipment necessary to prepare a wash that is of consistent quality and dependable from day to day.

A careful study, including some time spent with pencil and sketch pad, may indicate the desirability of rearranging facilities. A reduction of necessary handling of materials and a smoother flow of work can be translated into cost reduction. Even a study of a molder's bench with a view toward greater convenience can have worthwhile results.

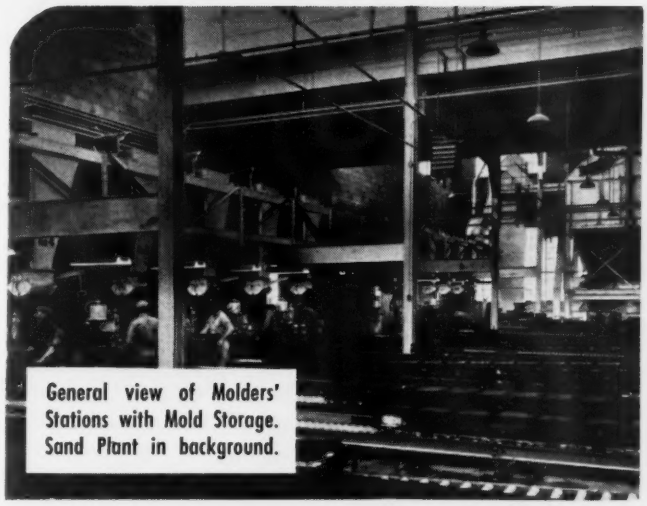
A Machine May Pay Off—Although much can be accomplished without capital expenditure, the small foundry operator should be on the lookout continuously for equipment for which he can justify a capital expenditure.

For example, in a coremaking operation it may be demonstrated that a bench core blower with one operator may meet his coremaking requirements where two bench coremakers are now required. In such a case he must determine what work he may have requiring cores in the foreseeable future. If he can calculate that he will have enough work for two bench coremakers, or one coreblower, for a long enough period so that the reduction in coremaking cost will equal the cost of the coreblower, installation and rigging, then the purchase of the machine can be a wise investment.

Of course, accuracy in calculating the time for self-amortization of the machine is important. In a small business, it is desirable that it be a period of one year or less, although this is a matter for the owner's judgment. He must ward off sales pressure to purchase equipment beyond his needs and his possibilities for recovering the payment through cost reduction in a reasonable time. On the other hand, the possibility of future expansion should be considered. Other factors are the reduced need for skilled help and increased maintenance problems.

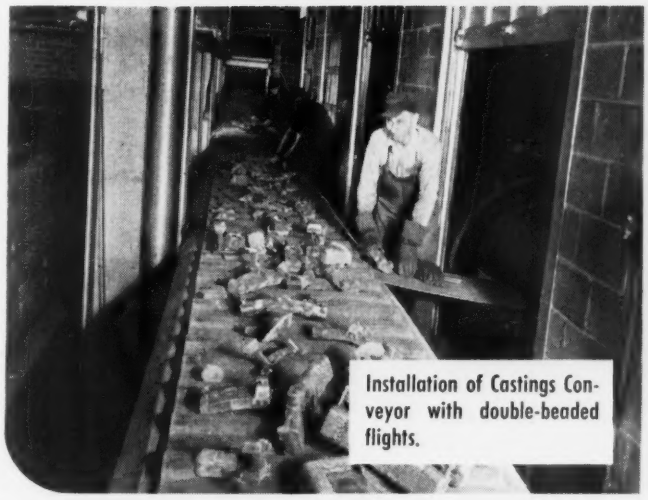
(*Continued on page* 266)

NAVAL SURVEY: Six Naval officers are shown during a survey of the Rensselaer Valve Co., Troy, N. Y., taken as a required part of a graduate management engineering course which they finished recently at Rensselaer Polytechnic Institute, also at Troy. Left to right, Lt. Cmdr. Julian A. Torrey, USN; Lt. Cmdr. H. C. Page, USN; Lyman C. Thunfors, president, Rensselaer Valve Co.; Cmdr. Ernest A. Ryavec, USNR; Prof. W. F. Spafford, Rensselaer Polytechnic Institute; Lt. Cmdr. Earl J. Fraley, USNR; Lt. Cmdr. Morton A. Prager, USN; and Lt. Cmdr. Gordon F. Spooner, USNR

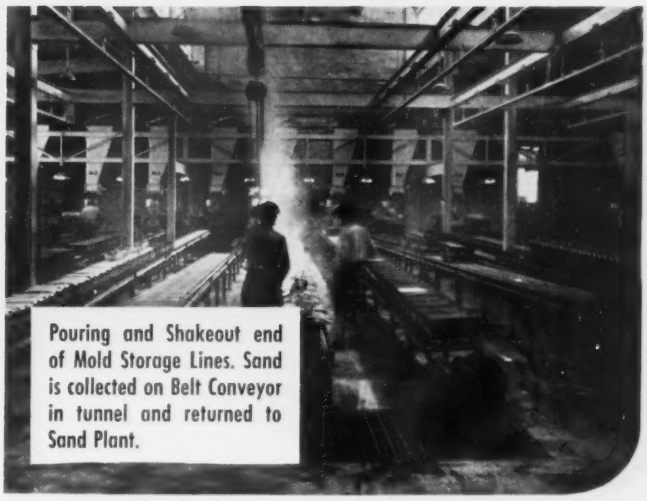


General view of Molders' Stations with Mold Storage. Sand Plant in background.

Modernization... steps up production and profits



Installation of Castings Conveyor with double-beaded flights.



Pouring and Shakeout end of Mold Storage Lines. Sand is collected on Belt Conveyor in tunnel and returned to Sand Plant.

When You Mechanize, Do it the Jeffrey Way!

Foundry mechanizations since the war have increased worker-production up to 20% according to government figures. Much of this improvement came through minimizing manual movement.

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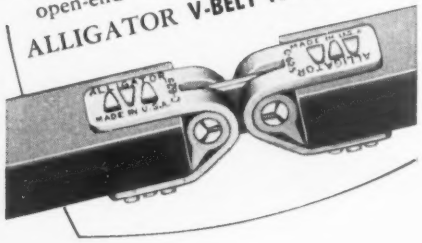

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ALLIGATOR
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(*Continued from page* 246)

Although the owner of a small foundry may feel in a period of good business that these procedures are unnecessary, it is well to consider that any permanent cost reductions will be of value at times when larger foundries are forced to take in short-run jobs ordinarily left to the small shop. At such times ability to compete in the market may prevent liquidation of the small foundry.

Check on Technical Progress—The wealth of current technological information also should be examined carefully by the small shop operator. A large amount of research, experimental and development work is available to him at little cost, and most of it can be applied to small-scale operations as well as to large. For example, by applying the recent developments gained by studies in the solidification of metals, he may find he is using more risers than necessary. By reducing their number, he cuts the amount of metal he must melt to pour a given casting, the molding time required and the grinding of riser stubs. In the production of steel and malleable castings, the neckdown riser core may result in valuable cost reduction. A survey of gating practice alone can result in large savings and improved quality and appearance of the product.

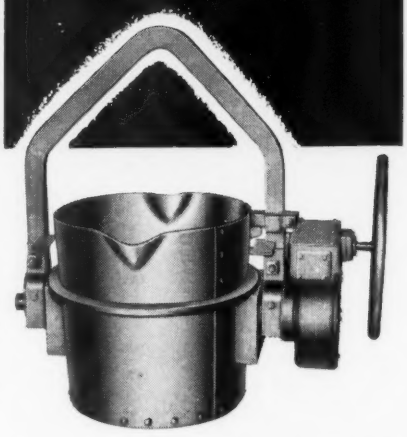
An investigation of sand practices can be helpful in many ways. For example, a foundryman who suddenly finds himself pushed for corebaking capacity should consider the use of fast-baking core oils or resin binders which might make his core oven utilization more efficient. Of course, he also must consider the moisture content of his core sand since full effectiveness of the new binders in the reduction of baking time is not attainable with excessive moisture.

The subject of quality controls in the foundry often is considered in the light of glistening, expensive laboratory equipment which is nice if it can be afforded. Although the purchase of laboratory equipment should never be looked upon as a necessary evil, the owner of a small operation who has some ingenuity often can get valuable information with only basic equipment.

Many indications of the quality of his melted metal are integrated in a fluidity test. Standard fluidity testing equipment is readily available, or the small-scale operator can develop his own. As long as the results are to be related to his own shop and as long as his practices in pouring it are uniform, the test can be of value to him.

Core sand baking characteristics can be checked easily by ramming a cubical core, baking it a given length

Good-by Heat Distortion Worries



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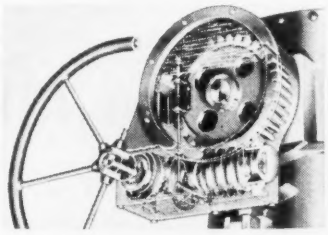
Simple, safe, strong, and dependable —Industrial's Universal Bail never needs lubrication. Provides complete flexibility with both horizontal and vertical adjustments. Misalignment is taken care of by rotating swivel action. Universal-type flexible connection takes up all expansion.



2. Self-locking TIMKEN worm gear

No direct connection with the bail. Therefore cannot bind due to bowl and bail heat distortion. Accurate assembly—accurate pouring control. Self-locking in any position. Easily accessible lock nuts permit accurate, positive alignment and back-lash adjustment.

For safety, accuracy, operating ease, and low maintenance, specify:

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of time, immediately sectioning it and scooping out the unbaked section. If the specimens are tagged with pertinent data and saved, they may be used for comparison when other sand mixtures or binders are tried. An item to be considered is the test core dimensions — they should be large enough so that the core does not bake out completely under any conditions.

For studies of sand at high temperatures, the dip test, as developed by J. B. Caine and described in FOUNDRY (July, 1947, p. 72) is excellent for use by the small foundry. Essentially, it consists of ramming an arbor into a 2 x 2-in. sand specimen so that the specimen can be attached to a long handle and immersed in molten metal or held in a position where it receives radiated heat from the metal. The foundryman can secure results by observing the specimen before and after applying it to molten metal. By use of a stopwatch, quantitative results can be recorded.

The above three methods cost relatively little yet give tangible results. The ingenious foundryman no doubt can devise others, but the most careful consideration should be given to the acquisition of the basic pieces of laboratory equipment. Their intelligent use can add to the value of the finished product.

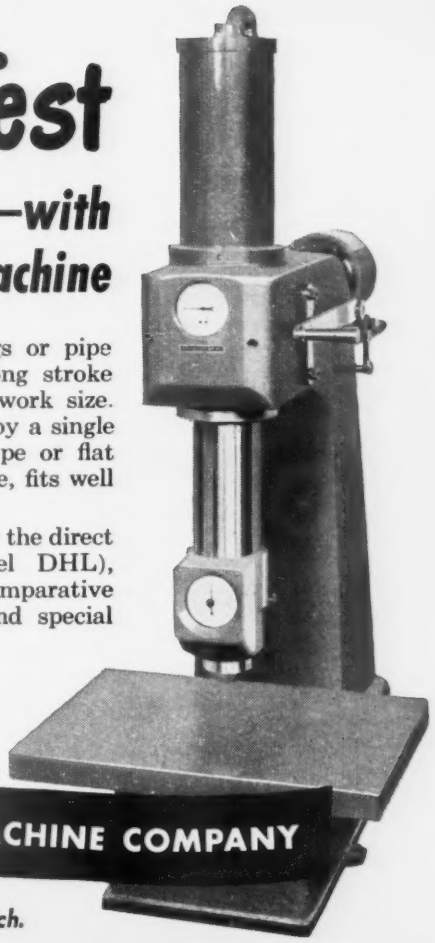
Know Your Costs — Perhaps the knowledge most important to small foundries is the cost of producing their castings. The operator who quotes prices on his castings on an over-all per-pound price or molder-hour rate may find the cost of not having some simple cost accounting system ruinous.

Actually, cost accounting need not be done by highly complicated or time consuming means. It consists of applying the costs directly to a job, rather than lumping them together and prorating them on a tonnage or molder-hour basis. For example, in a small shop a simple card system can be used. Each worker notes on a card the number of the job he works on, the quantity of pieces worked and the number of hours applied. If these figures are kept for each operation, an accurate cost of labor can be obtained.

Any special operations applicable to a given job, such as sand preparation or service labor, also should be included. Materials used in each operation must be recorded and charged to the job. Every effort should be made to identify and apportion costs directly. The cost of a mold carry-out helper should not be lumped into indirect labor if a large percentage of molds do not require this service. This information can be transferred

Brinell Test

large pieces fast—with this long stroke machine



Large awkward castings, forgings or pipe are easily tested because the long stroke eliminates screw adjustment to work size. The hydraulic ram is controlled by a single lever. Large, stationary roller-type or flat table makes work handling simple, fits well into a conveyor line.

Choice of plain Brinell machine or the direct reading machine (shown, model DHL), where dial at end of ram gives comparative hardness immediately. Larger and special machines may also be had.

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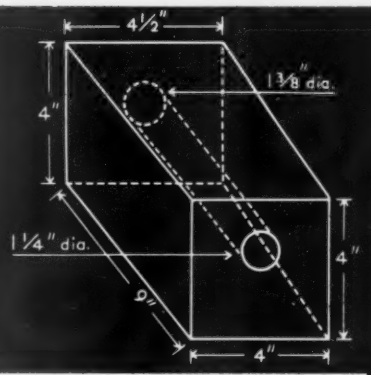
How to eliminate slag hole failures



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daily to master cards which can be referred to at any time to determine the job costs.

Overhead charges can be prorated on a basis of tonnage or man-hours only after careful consideration to determine whether the overhead costs cannot be placed directly. It may be that certain types of work require additional clerical or engineering work. Ordinarily the cost of a clerk would be considered as overhead, but where a determinable amount of his time can be apportioned to known jobs, it should be so charged.

The process as described above may be oversimplified, but generally what operators of small foundries have to know can be determined in this way. Actually, the information gained is of historical value and cannot always be used reliably to predict costs when quoting on jobs. It is of value, however, as a yardstick of the method used in quoting and in quoting on repeat orders. It also will point out realistically what work is unprofitable. By knowing these factors, the small foundry will know where the most profitable source of orders is and may find occasionally that a judicious price reduction, based on reliable cost figures, will make sales efforts more effective.

Efforts toward cost control and accurate cost estimates for quotations can be helped greatly by setting standard cost data. To do this accurately requires the services of skilled industrial engineers, and in a great many cases their services on a temporary consulting basis may be profitable.

The operator of a small foundry, if he is not an engineer himself, should consider hiring an engineer to seek out where his problems lie and how to correct them. If a competent man is not easily found, the retention of outside engineering help on a part-time basis may be useful. If such services are obtained, they can be used best to get a true picture of the present status of operations and from this to obtain recommendations and realistic plans for the future.

The foregoing discussion is designed primarily to point out that a foundry produces castings and that whether it is large or small is not always important to what it can do. Some small foundries take the stand that today's developments are mostly for the benefit of the big operator. Overcoming such an attitude is of first importance to the owner of a small foundry because it can allow him to miss much of what he could put to good use. His attitude should be, "What's in it for me?" There usually will be something if he tries to find it.

Book Review

Lubrication of Industrial and Marine Machinery, by the late William Gordon Forbes, revised by C. L. Pope and W. T. Everitt, cloth, 351 pages, 6 x 9 in., published by John Wiley & Sons Inc., 440 Fourth Ave., New York 16. Price $6.50.

First printed in 1943, the book has been revised to include major contemporary developments in the field. It explains graphically how to put to best everyday use the fundamental characteristics of conventional lubricants. It interprets the chemistry, refining, compounding and specifications of lubricants, and dwells at some length on the limitations to which certain types can be extended.

Basic principles are evolved in a manner calculated to avoid needless repetition. Relative to the specific lubricating process involved, the authors include descriptions of some of the more common types of basic mechanisms such as compressors, bearings, gears and pumps.

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TRADE PUBLICATIONS

For More Details Use Reply Card—Page 243

MELTING FURNACES: Stroman Furnace & Engineering Co., 9900 Franklin Ave., Franklin Park, Ill.—Stationary and tilting melting furnaces for nonferrous metals and iron are shown in bulletin 800. Aluminum die casting furnaces, core ovens, and other foundry equipment are illustrated.

For More Details Circle No. 141—Page 243

CONVEYOR BELTING: Imperial Belting Co., 1750 South Kilbourn Ave., Chicago 23, Ill.—Folder 54-3 gives a capsule description of construction and types of treated stitched canvas belting for all conveying and elevating applications. Belts are designed to handle hot materials of various temperatures to a maximum of 600°F.

For More Details Circle No. 142—Page 243

SHELL MOLDING RESIN: Bakelite Co., Division of Union Carbide & Carbon Corp., 30 East 42nd St., New York 17, N. Y.—Technical bulletin 1 describes the properties of a two-step phenolic shell molding resin. Strength characteristics of the resin as affected by seven variables are shown in a series of graphs.

For More Details Circle No. 143—Page 243

MOLDING MACHINE: Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.—A two-station indexing type jolt, squeeze, strip machine is described in folder JSI-2-54. Specifications, diagrams, and detailed information on the operation of the machine are included.

For More Details Circle No. 144—Page 243

CRUCIBLES: Crucible Manufacturers' Association, 27 William St., New York 5, N. Y.—Proper crucible care is covered in the first of a series of leaflets. Information on inspection, storage, starting, short heats, wedging metal and cleaning of crucibles is given.

For More Details Circle No. 145—Page 243

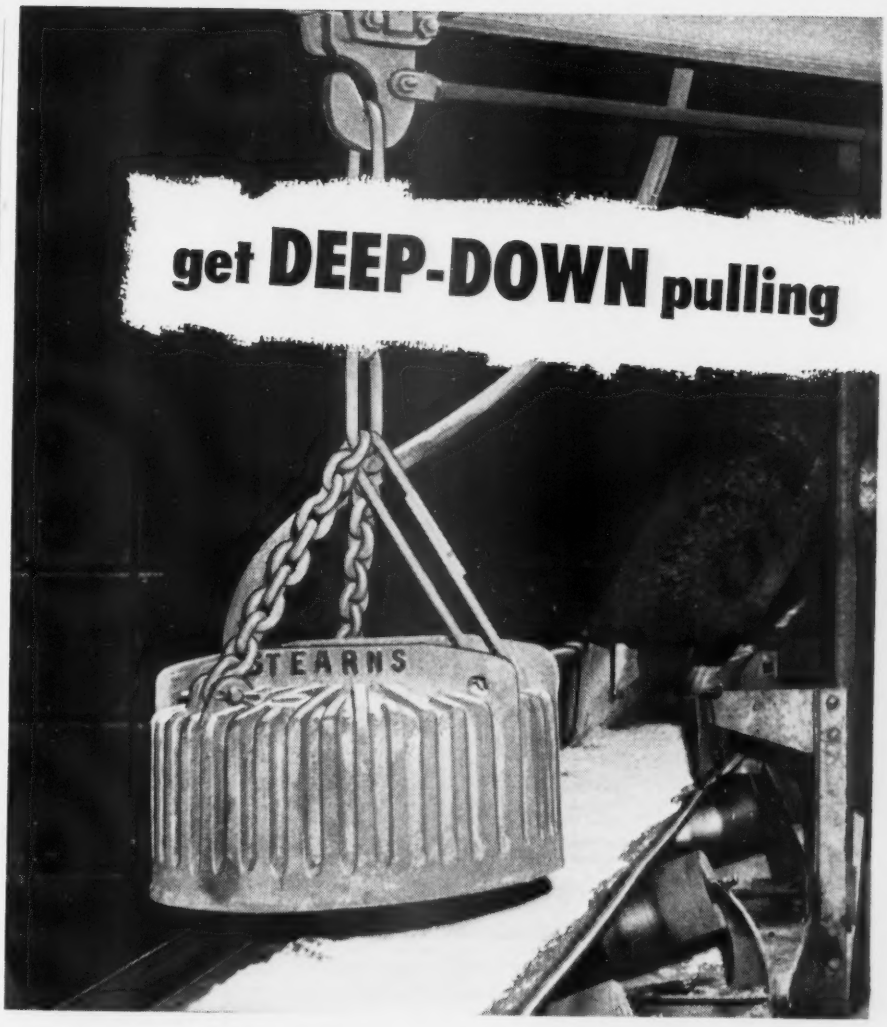
VACUUM FURNACES: F. J. Stokes Machine Co. Inc., 5500 Tabor Rd., Philadelphia 20, Pa.—Applications of vacuum furnaces in melting and casting, sintering, annealing, hardening, brazing and degassing are described in bulletin 790. Drawings of furnaces are included.

For More Details Circle No. 146—Page 243

COLLOIDS: Acheson Colloids Co., Division of Acheson Industries Inc., Port Huron, Mich.—Booklet lists dispersions of colloidal graphite, molybdenum disulfide. vermiculite and zinc oxide. Applications, densities, carriers and other important data are given.

For More Details Circle No. 147—Page 243

WIRE ROPE: John A. Roebling's Corp., Subsidiary of Colorado Fuel & Iron Corp., 640 South Broad St., Trenton, N. J.—New publication,



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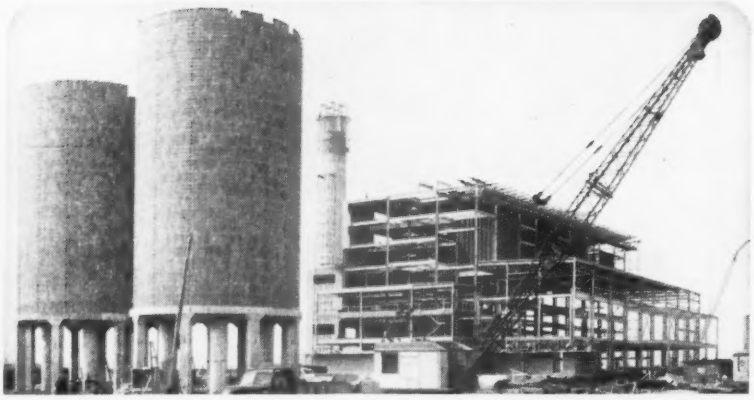

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"Wire Rope Recommendations and Catalog," provides simplified ordering plan and reference for wire rope users.

For More Details Circle No. 148—Page 243

STOCK CYLINDERS: Miller Fluid Power Co., 2040 N. Hawthorne Ave., Melrose Park, Ill.—Price list covers complete line of stock cylinders in interchangeable mountings, including air cylinders from 2 through 8-in. bores, hydraulic cylinders from 1½ through 4-in. bores, and both cushioned and noncushioned types. Strokes range from 2 through 13 in.

For More Details Circle No. 149—Page 243

POWER BRUSHES: C. W. Morris Co., 10628 Cloverdale, Detroit 4, Mich. —Catalog of power-driven brushes gives 16 pages of facts, application data and product data for such work as deburring, roughing, stripping, finishing, polishing, grinding, removing rust, scale, corrosion, etc. Illustrated are models up to 15 in. diam, miniature sections down to 1⅜-in., end brushes including knot type, solid filled and circular, and models for special types of production work.

For More Details Circle No. 150—Page 243

FIRECLAY REFRACTORIES: Harbison-Walker Refractories Co., Farmers Bank Bldg., Pittsburgh 22, Pa.—Descriptive data and charts of spalling resistance, the results of load tests and thermal expansion make up bulletin.

For More Details Circle No. 151—Page 243

TRACTOR LOADER: Baker-Lull Corp., 314 West 90th St., Minneapolis 20, Minn.—A rubber-tired tractor loader with a standard bucket capacity of 12 cu ft is described in a catalog containing specifications, data and action diagrams.

For More Details Circle No. 152—Page 243

BLAST BURNER: Eclipse Fuel Engineering Co., Rockford, Ill.—Combination blast burner and proportional gas-air mixing assembly is described in schematic drawings and specifications in a bulletin.

For More Details Circle No. 153—Page 243

RIDDLES: Beardsley & Piper, Division of Pettibone Mulliken Corp., 2424 North Cicero Ave., Chicago 39, Ill.—Foundry sand riddles are illustrated in folder. Specifications are included.

For More Details Circle No. 154—Page 243

ADJUSTABLE SLING: Caldwell Co., 1830 Camp Ave., Rockford, Ill. —Form 354 describes an adjusting and locking sling. A table of specifications is included.

For More Details Circle No. 155—Page 243

FATIGUE TESTING: Baldwin-Lima-Hamilton Corp., Testing Equipment Dept., Philadelphia 42, Pa.—

PYRO

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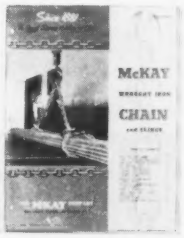
THE PYROMETER INSTRUMENT COMPANY inc.
Bergenfield 6, New Jersey, U. S. A.

Constant force fatigue machine designed with furnace and control equipment for direct stress fatigue testing at elevated temperatures is described in bulletin 4214.
For More Details Circle No. 156—Page 243

FRICTION SAWS: Kling Bros. Engineering Works, 1320 North Kostner Ave., Chicago, Ill.—Two new bulletins feature the faster cutting of ferrous metals made possible with friction sawing. Bulletin 4200 covers the latest developments on a horizontal stroke high speed friction saw. Bulletin 9200 features downstroke and horizontal stroke friction saws in a wide range of models and sizes. Data on blades are included.
For More Details Circle No. 157—Page 243

CRANE DRIVE: General Electric Co., Schenectady 5, N. Y.—Bulletin GEA-5408A uses cutaway and exploded views of direct current crane motors and controls, in addition to typical speed-load and performance curves. Features of the company's crane drive equipment also are stressed.
For More Details Circle No. 158—Page 243

CHAIN AND SLINGS: McKay Co., 326 McKay Bldg., Pittsburgh 22, Pa.—Bulletin C contains complete data on sizes, specifications, link dimensions, standard finishes and other pertinent information on specific grades of fire welded wrought iron chains in ⅜-in. material diam and larger. Detailed drawings show the various types of single branch and double branch sling chains most commonly used and indicate the various types of attachments and accessories which can be used on wrought iron chain assemblies. Application suggestions, working load limits and table of specifications are included.



For More Details Circle No. 159—Page 243

CUSHIONING AGENT: Ironton Fire Brick Co., P. O. Box 124, Ironton, O.—Properties of foundry grade perlite are described in technical bulletin No. 2. Illustrations of aluminum silicate mineral used as a sand additive in molding sand applications are given.
For More Details Circle No. 160—Page 243

GRINDING WHEELS: Macklin Co., Jackson, Mich.—The making of a grinding wheel is shown in this 64-page booklet. Rules for selection and safe operation of grinding wheels are given. Tables of speeds and general data are included.
For More Details Circle No. 161—Page 243

WELDING POSITIONERS: Welding Division, Harnischfeger Corp., Milwaukee 46, Wis.—Bulletin PL-1 outlines important features and gives condensed specifications on four dif-

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For More Details Circle No. 162—Page 243

TEMPERATURE TABLE: Moeller Instrument Co., 132nd St. & 89th Ave., Richmond Hill 18, N. Y. — Handy, pocket size chart of fahrenheit and centigrade temperature equivalents also shows reading qualities of company's thermometers.

For More Details Circle No. 163—Page 243

CLEANING EQUIPMENT: Pangborn Corp., Hagerstown, Md.—Bulletin 1210 describes a complete line of blast cleaning and dust control equipment. A special index simplifies the use of the bulletin. All equipment and accessories are listed by equipment, by type and by purpose. The various methods of abrasive application are discussed and illustrated. Special machines are included in the description.

For More Details Circle No. 164—Page 243

PAINTING SPECIFICATIONS: Sherwin-Williams Co., Cleveland 1, O.—Booklet entitled "Painting Specifications and Buyer's Guide" includes a section on metal protective finishes for industrial buildings. Sample colors are included.

For More Details Circle No. 165—Page 243

RUBBER PRODUCTS: Carlyle Rubber Co., Dept. B-22, 64 Park Place, New York 7, N. Y.—Catalog lists specification and price information on many types of rubber hose and belting for the foundry, construction, mining and quarrying industries.

For More Details Circle No. 166—Page 243

AIR COMPRESSORS: Joy Mfg. Co., Henry W. Oliver Bldg., Pittsburgh, Pa.—Information on operation and construction of heavy-duty air compressors is given in bulletin A 72. Seven models are illustrated.

For More Details Circle No. 167—Page 243

PIPE MARKERS: W. H. Brady Co., 727 West Glendale Ave., Milwaukee 12, Wis.—Bulletin 135-B describes pipe markers that conform to ASA standard No. A-13. Markers are self-sticking and mounted on cards.

For More Details Circle No. 168—Page 243

SKIP HOISTS: C. O Bartlett & Snow Co., 6018 Harvard Ave., Cleveland 5, O.—Applications and advantages of skip hoists are given in bulletin 110. Dimensioned diagrams and capacities are included.

For More Details Circle No. 169—Page 243

CONVERSION EQUIPMENT: Nuclear Power Co., 550 Fifth Ave., New York 36, N. Y.—Description of conversion equipment for direct current requirements and technical in-

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formation on direct current power supplies for general industrial applications, industrial battery chargers and diesel engine starters is given in catalog.

For More Details Circle No. 170—Page 243

ROOF DECKS: Vermiculite Institute, 208 South LaSalle St., Chicago 4, Ill.—Fireproof, insulated roof decks are covered in three new technical folders issued recently. Developments covered are concrete over vented steel roof decks and over paper-backed wire lath.

For More Details Circle No. 171—Page 243

HYDRAULIC DRIVES: Oilgear Co., 1580B West Pierce St., Milwaukee 4, Wis.—Bulletin 56610 describes packaged hydraulic drive output units and reducers. Specifications cover variable speed drives. Installation dimensions are included.

For More Details Circle No. 172—Page 243

pH METER: Coleman Instruments Inc., 318 Madison St., Maywood, Ill.—Bulletin B-225 describes a one-dial, portable pH meter. Certified buffer tablets also are mentioned.

For More Details Circle No. 173—Page 243

AIR POWER: Mead Specialties Co., Catalog Dept. 8, 4114 North Knox Ave., Chicago 41, Ill. — Air-operated devices such as air cylinders, air clamps, presses, workfeeders, vises, collets, drill press feeds, column presses, timers, impact hammers and valves are illustrated and described in a new 52-page catalog. Each product listed is pictured in a photograph plus a schematic drawing.

For More Details Circle No. 174—Page 243

ALLOY DATA SHEETS: Cooper Alloy Foundry Co., Hillside, N. J.—Booklet includes eleven reference sheets covering the major stainless alloys. Chemical composition, properties, resistance to corrosion and other information is given.

For More Details Circle No. 175—Page 243

FORK LIFT TRUCKS: Buda Co., Division of Allis-Chalmers Mfg. Co., Harvey, Ill.—Outline dimensions, capacities, specifications, and operating data of fork lift trucks available in gasoline or diesel models are given in bulletin 1681.

For More Details Circle No. 176—Page 243

MELTING FURNACES: Monometer Mfg. Co. Ltd., 115-116 Strand, London, W. C. 2, England—Illustrated folder shows features and operating installations of metal melting furnaces available as oil or gas-fired.

For More Details Circle No. 177—Page 243

SPRAY BOOTHS: Newcomb-Detroit Co., 5741 Russell St., Detroit 11, Mich.—Bulletin 4938-B contains general dimensions, mechanical and engineering data on several spray

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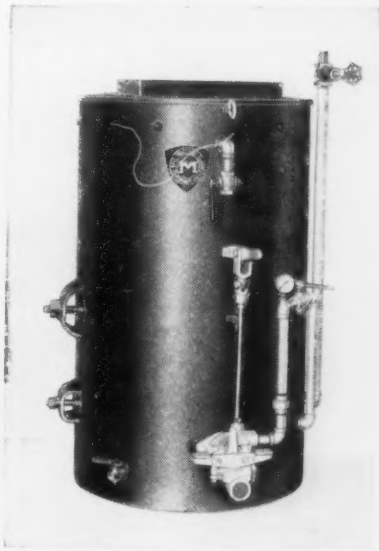

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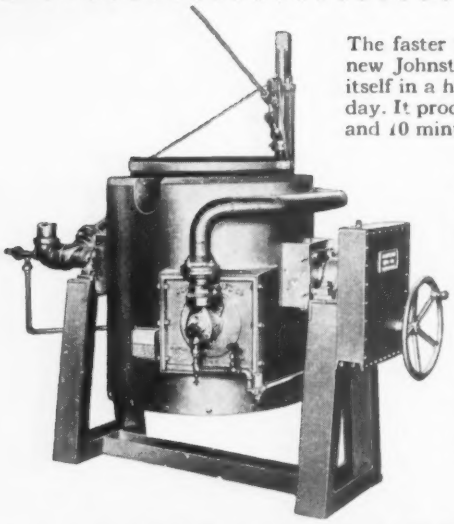

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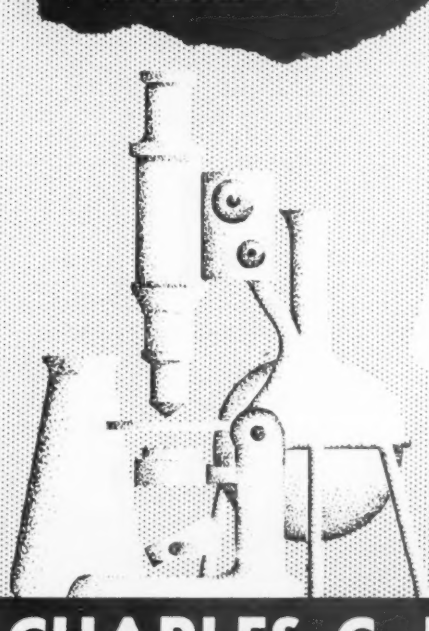

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For More Details Circle No. 178—Page 243

CORE OILS: Swan-Finch Oil Corp., 205 East 42nd St., New York 17, N. Y.—Claimed advantages of the company's core oils are presented in this illustrated bulletin. The company's free consulting service also is described.
For More Details Circle No. 179—Page 243

UNIT HEATERS: Dravo Corp., 1203 Dravo Bldg., Pittsburgh 22, Pa. —Several commercial and industrial, gas fired, warm air unit heaters having output capacities of 88,000 to 160,000 Btu per hr are illustrated and described in bulletin 543-B.
For More Details Circle No. 180—Page 243

COATED ABRASIVES: Clover Mfg. Co., Norwalk, Conn.—Illustrated handbook describes the making and use of coated abrasives. Various abrasives employed and types of coated materials offered are discussed.
For More Details Circle No. 181—Page 243

COMPRESSORS: Gardner-Denver Co., Quincy, Ill.—Bulletin GP-100 gives a complete listing of all company products including pumps, compressors and pneumatic equipment.
For More Details Circle No. 182—Page 243

SILICONE PARTING: Linde Air Products Co., 30 East 42nd St., New York 17, N. Y.—Silicone parting emulsions used in the shell molding process are described in illustrated bulletin F-8271A.
For More Details Circle No. 183—Page 243

CUPOLAS: Whiting Corp., Harvey, Ill.—Developments in cupola design and manufacture, analyses of various hot blast systems and complete specifications on cupolas are given in bulletin FY-172.
For More Details Circle No. 184—Page 243

HOSE COUPLING: Industrial Sales, Titeflex Inc., Hendee St., Springfield 4, Mass.—Quick connect-disconnect hose coupling for water, oil, steam, gas and chemical lines is described in bulletin.
For More Details Circle No. 185—Page 243

CUTTING GASES: Acetogen Gas Co., 20137 Sherwood Ave., Detroit, Mich.—Properties of cutting gases and illustrations of cutting equipment are given in booklet.
For More Details Circle No. 186—Page 243

SHELL MOLDING: Shell Process Inc, McKinstry Ave, Chicopee, Mass. —Booklet includes illustrations and specifications for shell molding machine and shell bonding fixture.
For More Details Circle No. 187—Page 243

WELDING AND CUTTING: K-G Equipment Co., P.O. Box 538, Allentown, Pa.—Complete descriptions of welding and cutting equipment are given in illustrated catalog 54E.
For More Details Circle No. 188—Page 243

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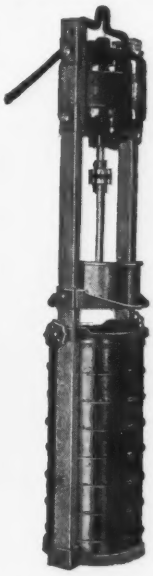

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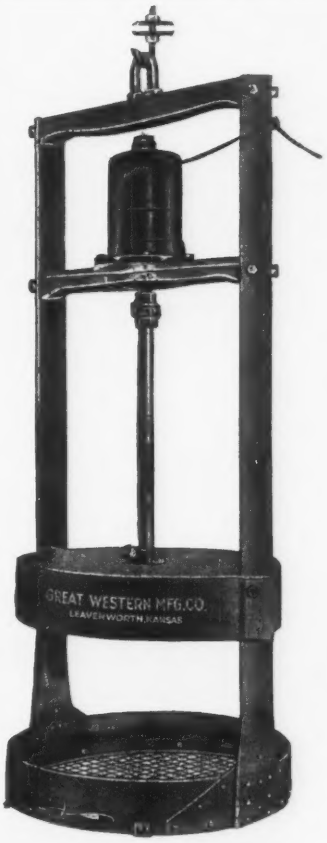

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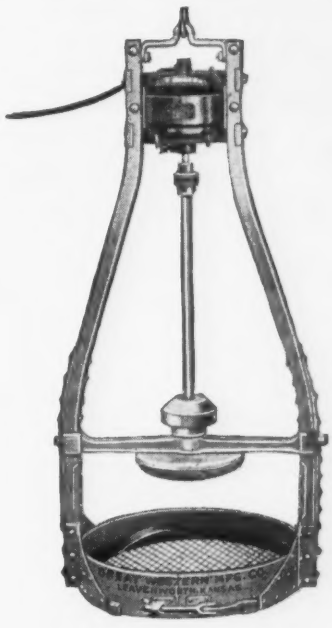

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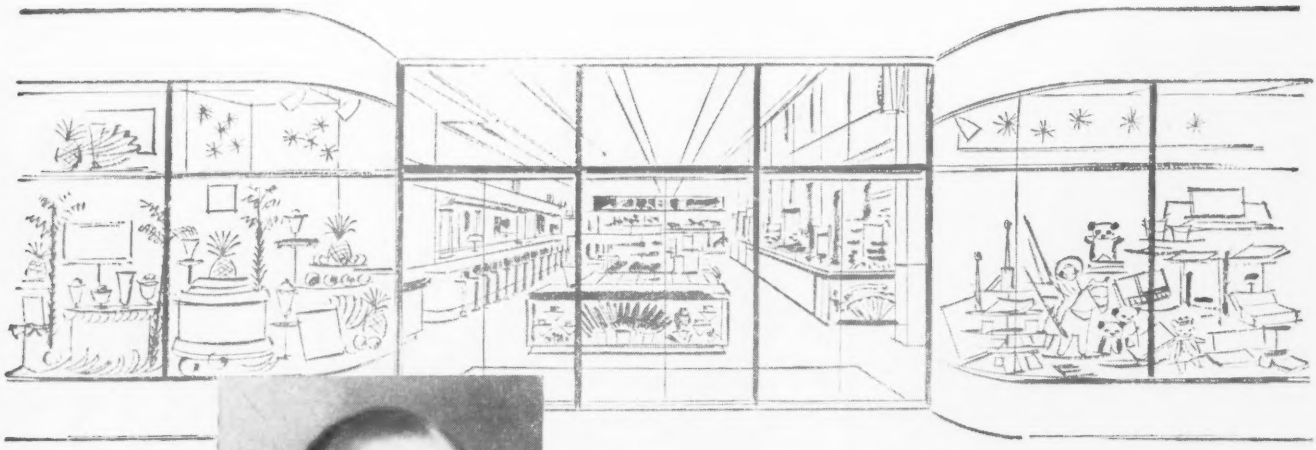

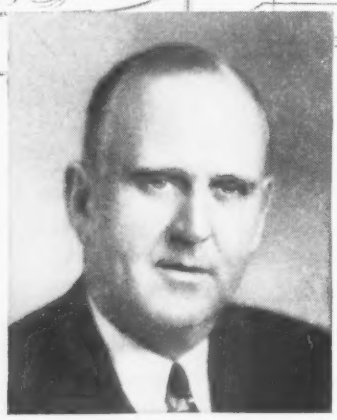

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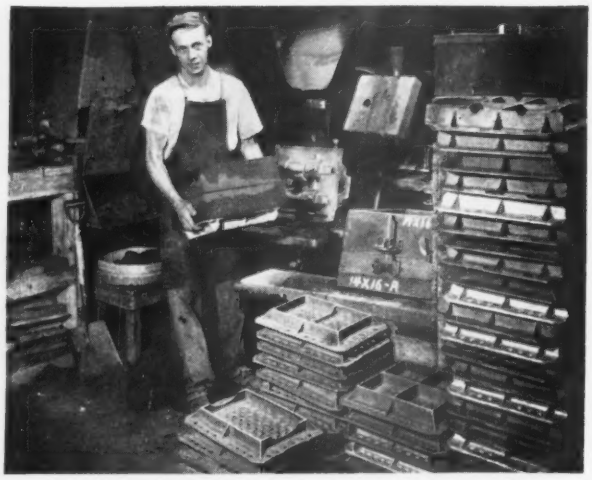

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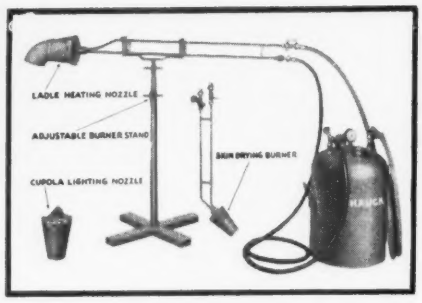

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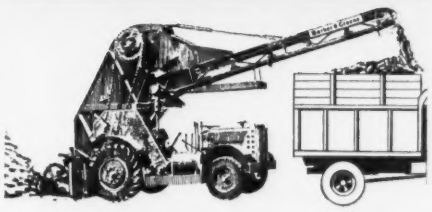

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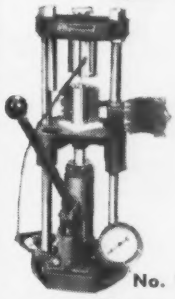

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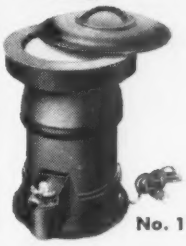

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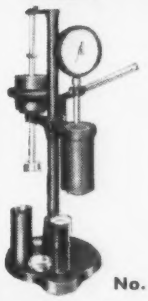

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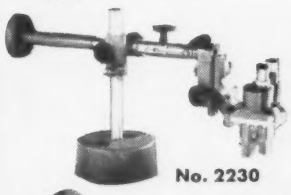

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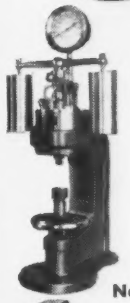

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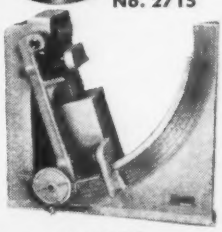

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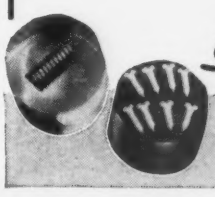

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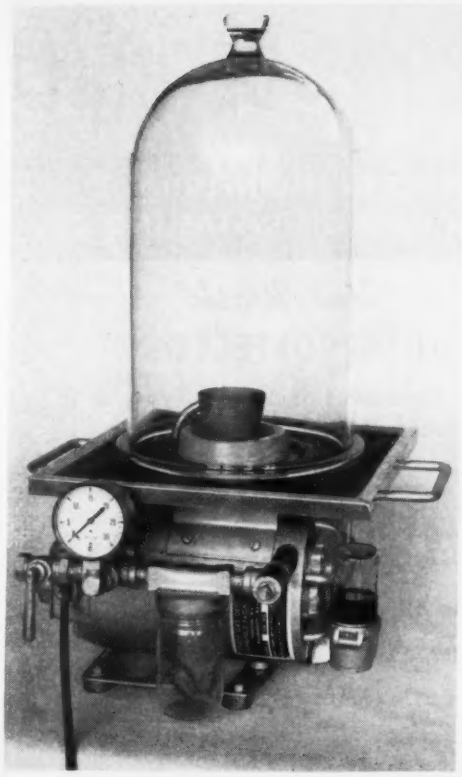

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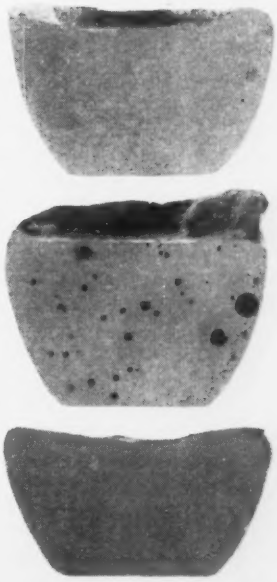

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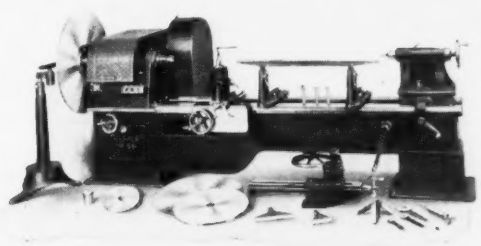

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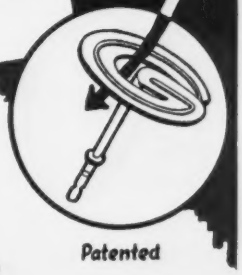

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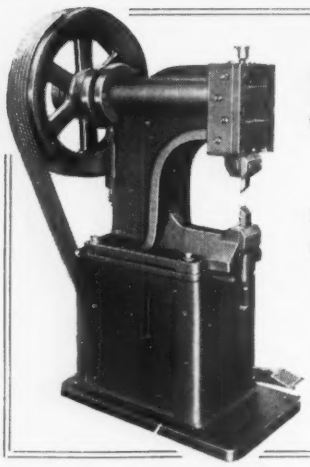

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BUSHINGS—See FLASK BUSHINGS and PINS

CALCIUM BORIDE

Molybdenum Corporation of America, Pittsburgh 19, Pa.

CALCIUM MOLYBDATE

Molybdenum Corporation of America, Pittsburgh 19, Pa.

CARBON BOOSTER

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Great Lakes Carbon Corp., Hancock Bldg., Niagara Falls, N. Y.
National Carbon Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
United States Graphite Co., Saginaw, Mich.

CARS (Core Oven)

Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.

CARS (Mold Drying)

Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.

CASTING GRIPS (Air Powered)

Joy Mfg. Co., Henry W. Oliver Bldg., Pittsburgh 22, Pa.

CASTING MACHINES (Centrifugal)

Centrifugal Casting Mach. Co., Tulsa, Okla.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.

CASTING MACHINES (Permanent Mold)

Centrifugal Casting Machine Co., Tulsa, Okla.

CASTING SEALER—See Impregnating Systems

CASTINGS

City Pattern Foundry & Machine Co., 1165 Harper, Detroit 11, Mich.
Link Belt Company, 307 North Michigan Ave., Chicago 1, Ill.
Wellman Bronze & Aluminum Co., 12800 Shaker Blvd., Cleveland 20, Ohio.

CEMENT (Metallic)

M. A. Bell Co., 217 Lombard St., St. Louis 2, Mo.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Smooth-On Manufacturing Co., 570 Communipaw Ave., Jersey City 4, N. J.
Frederic B. Stevens, Inc., Detroit 16, Mich.

CEMENT (Refractory)

Bay State Abrasive Products Co., Westboro, Mass.
M. A. Bell Co., 217 Lombard St., St. Louis 2, Mo.
Carborundum Co., Perth Amboy, N. J.
A. P. Green Fire Brick Co., Mexico, Missouri.
Harbison-Walker Refractories Co., 1745 Farmers Bank Bldg., Pittsburgh 22, Pa.
Ironton Fire Brick Co., Ironton, O.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.
Mexico Refractories, Mexico, Mo.
Mullite Refractories, Shelton, Conn.
Norton Co., Worcester 6, Mass.

CHAIN (Hoist, Conveyor, Drive, Sling, etc.)

American Chain Div., American Chain & Cable Co. Inc., York, Pa.
Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Great Western Mfg. Co., Leavenworth, Kansas.
Jeffrey Mfg. Co., 907-99 N. Fourth St., Columbus, O.
Joy Mfg. Co., Henry W. Oliver Bldg., Pittsburgh 22, Pa.
Link-Belt Co., 307 North Michigan Ave., Chicago 1, Ill.
S. G. Taylor Chain Co., Hammond, Ind.

CHAPLETS

M. A. Bell Co., 217 Lombard St., St. Louis 2, Mo.
Cleveland Chaplet & Mfg. Co., 26470 Lakeland Blvd., Cleveland 23, O.
Combined Supply & Equipment Co., Inc., 215 Chandler St., Buffalo 7, N. Y.
Crescent Brass & Pin Co., 5766 Trumbull Ave., Detroit, Mich.
Fanner Mfg. Co., Brookside Park, Cleveland 2, Ohio.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Milwaukee Chaplet & Mfg. Co., 1023 S. 40th St., Milwaukee 4, Wis.
Shanafelt Mfg. Co., 3623 Winfield Way, N.E., Canton 5, O.
Frederic B. Stevens, Inc., Detroit 16, Mich.

CHEMICALS

Hercules Powder Co., Wilmington 99, Del.
Mathieson Chemical Corp., Mathieson Bldg., Baltimore 3, Md.
Monsanto Chemical Co., Plastics Div., Springfield 2, Mass.

CHEMISTS

Chas. C. Kawin Co., 431 S. Dearborn St., Chicago 5, Ill.

CHILLS

Alloy Metal Abrasive Co., 311 W. Huron St., Ann Arbor, Mich.
Fanner Mfg. Co., Brookside Park, Cleveland 2, Ohio.
Milwaukee Chaplet & Mfg. Co., 1023 So. 40th St., Milwaukee 4, Wis.
Standard Horse Nail Corp., New Brighton, Pa.

CHILL COATINGS

Acheson Colloids Co., Port Huron, Mich.
Thiem Products Co., 9800 West Rogers, Milwaukee 14, Wis.

CHILL NAILS—See NAILS (chill)

CHIPPERS—See PNEUMATIC TOOLS

CHISELS (Chipping) —See PNEUMATIC TOOLS and CHISELS

CHROMIUM (Briquets)

Electro Metallurgical Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

CLAMPS (Flask)

Black Sivalls & Bryson, Inc., 7500 E. 12th St., Kansas City 3, Mo.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.
Pressed Steel Div., Republic Steel Corp., 6100 Truscon Ave., Cleveland, Ohio.
Shanafelt Mfg. Co., Canton, Ohio.
Sterling Wheelbarrow Co., 1700 W. Walker St., Milwaukee 14, Wis.

CLAY (Bonding)

Baroid Sales Division, 637 Railway Exchange Bldg., 80 East Jackson Blvd., Chicago 4, Ill.
Carpenter Brothers, Inc., 606 West Wisconsin Ave., Milwaukee 3, Wis.
Cedar Heights Clay Co., Oak Hill, Ohio.
Eastern Clay Products Dept. International Minerals & Chemical Corp., 20 N. Wacker Dr., Chicago 6, Ill.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Harbison-Walker Refractories Co., 1745 Farmers Bank Bldg., Pittsburgh 22, Pa.
Hooker Electrochemical Co., Buffalo Avenue & 47th St., Niagara Falls, N. Y.
Illinois Clay Products Co., Joliet, Ill.
Ironton Fire Brick Co., Ironton, O.
Whitehead Bros. Co., 324 West 23rd St., New York 11, N. Y.

CLAY (Refractory)—See REFRACTORIES

CLEANING—See BLAST CLEANING EQUIPMENT

CLEANING COMPOUNDS

E. F. Houghton Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.

CLUTCHES (Magnetic)

Dings Magnetic Separator Co., 4740 Electric Ave., Milwaukee 7, Wis.
Stearns Magnetic Mfg. Co., 635 S. 28th St., Milwaukee 46, Wis.

COATINGS—See CORE and MOLD WASH

COKE (Oven)

Alabama By-products Corp., Post Office Box 354, Birmingham, Ala.
DeBardeleben Coal Corp., 2201 First Ave., N., Birmingham 3, Ala.
Hickman-Williams & Co., Union Commerce Bldg., Cleveland 14, O.
Philadelphia Coke Co., 4501 Richmond St., Philadelphia 37, Pa.
Pickands, Mather & Co., Cleveland 14, O.
Pittsburgh Coke & Chemical Co., Grant Building, Pittsburgh 19, Pa.
Republic Coal & Coke Co., 8 So. Michigan Ave., Chicago 3, Ill.
Semet Solvay Div., Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y.

COKE (Petroleum)

Great Lakes Carbon Corp., Hancock Bldg., Niagara Falls, N. Y.
Republic Coal and Coke Co., 8 S. Michigan Ave., Chicago 3, Ill.

CONVERTER BLOWERS—See BLOWERS

CONVERTERS (Bessemer)

Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

CONVEYOR DESIGN

Giffels & Vallet, Inc., Marquette Bldg., Detroit, Mich.
Link-Belt Co., 307 North Michigan Ave., Chicago 1, Ill.

CONVEYORS (Chain)

Jeffrey Mfg. Co., 907-99 N. Fourth St., Columbus 16, O.
Joy Mfg. Co., Henry W. Oliver Bldg., Pittsburgh 22, Pa.
Link-Belt Co., 307 North Michigan Ave., Chicago 1, Ill.
Logan Co., 580 Cabel, Louisville, Ky.
Mathews Conveyer Co., 104 Tenth St., Ellwood City, Pa.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Newaygo Engineering Co., Newaygo, Mich.
Richards-Wilcox Mfg. Co., 174 Third St., Aurora, Ill.
Standard Conveyor Co., North St. Paul 9, Minn.

CONVEYORS (Fabric, Rubber Belt)

Bartlett & Snow Co., C. O., 6201 Harvard Ave., Cleveland 5, O.
Beardsley & Piper Div. Pettibone Mulliken Corp., 2424 No. Cicero, Chicago 39, Ill.
Great Western Mfg. Co., Leavenworth, Kansas.
Imperial Belting Co., 1800 So. Kilbourn Ave., Chicago 23, Ill.
Jeffrey Mfg. Co., 907-99 N. Fourth St., Columbus 16, O.
Joy Mfg. Co., Henry W. Oliver Bldg., Pittsburgh 22, Pa.
Planet Corp., 1820 Sunset, Lansing 6, Mich.
Link-Belt Co., 307 North Michigan Ave., Chicago 1, Ill.
Logan Co., 580 Cabel, Louisville, Ky.
Mathews Conveyer Co., Ellwood City, Pa.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Newaygo Engineering Co., Newaygo, Mich.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.
Robins Conveyors Div., Hewitt-Robins Inc., 270 Passaic Ave., Passaic, N. J.
Standard Conveyor Co., North St. Paul 9, Minn.

CONVEYORS (Gravity Roller)

Alvey-Ferguson Co., 75 Disney St., Cincinnati 9, Ohio.
Logan Co., 580 Cabel, Louisville, Ky.
Mathews Conveyer Co., 104 Tenth St., Ellwood City, Pa.
Standard Conveyor Co., North St. Paul 9, Minn.
Westover Engineers, 3110 W. Fond Du Lac Ave., Milwaukee 10, Wis.

CONVEYORS (Live Roller)

Alvey-Ferguson Co., 75 Disney St., Cincinnati 9, Ohio.
Logan Co., 580 Cabel, Louisville, Ky.
Mathews Conveyer Co., Ellwood City, Pa.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Standard Conveyor Co., North St. Paul 9, Minn.

CONVEYORS (Magnetic)

Homer Mfg. Co., Lima, Ohio.

Stearns Magnetic Inc., 635 South 28th St., Milwaukee 46, Wis.

CONVEYORS (Metal Belt)

May-Fran Engineering, Inc., 1710 Clarkstone Road, Cleveland 12, Ohio.

CONVEYORS (Mold)

Bartlett & Snow, C. O., Co., 6201 Harvard Ave., Cleveland 5, O.
Beardsley & Piper Div. Pettibone Mulliken Corp., 2424 No. Cicero, Chicago 39, Ill.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Jeffrey Mfg. Co., 907-99 N. Fourth St., Columbus 16, O.
Link-Belt Co., 307 North Michigan Ave., Chicago 1, Ill.
Logan Co., 580 Cabel, Louisville, Ky.
Mathews Conveyer Co., Ellwood City, Pa.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Newaygo Engineering Co., Newaygo, Mich.
Planet Corp., 1820 Sunset, Lansing 6, Mich.

CONVEYORS (Overhead Monorail)

Alvey-Ferguson Co., 75 Disney St., Cincinnati 9, O.
American Monorail Co., 13104 Athens Ave., Cleveland 7, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 E. 283rd St., Wickliffe, O.
Jeffrey Mfg. Co., 907 N. Fourth St., Columbus 16, O.
Link-Belt Co., 307 North Michigan Ave., Chicago 1, Ill.
Mathews Conveyer Co., 104 Tenth St., Ellwood City, Pa.
Modern Equipment Co., Port Washington, Wis.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Penn Iron Works Inc., Reading, Pa.
Planet Corp., 1820 Sunset, Lansing 6, Mich.
Richards-Wilcox Mfg., 174 Third St., Aurora, Ill.
Whiting Corp., Harvey, Ill.

CONVEYORS (Pneumatic)

Crane Co., 836 South Michigan, Chicago 5, Ill.
Fuller Company, Catasauqua, Pa.
Gerwin Industries, 214 Spring St., Michigan City, Ind.
Metals Disintegrating Co., Inc., Pulverizing Machinery Div., Chatham Rd., Summit, N. J.

CONVEYORS (Portable)

American Conveyor Co., 1115 West Adams St., Chicago 7, Ill.
Joy Mfg. Co., Henry W. Oliver Bldg., Pittsburgh 22, Pa.

CONVEYORS (Vibrating)

Ajax Flexible Coupling Co., Westfield, N. Y.
Carrier Conveyor Corp., Frankfort Ave. at Clifton, Louisville 6, Ky.
Jeffrey Mfg. Co., 907 N. Fourth St., Columbus 16, O.
Link-Belt Co., 307 North Michigan Ave., Chicago 1, Ill.
Robins Conveyors Div., Hewitt-Robins Inc., 270 Passaic Ave., Passaic, N. J.
Simplicity Engineering Co., Durand, Mich.

COPPER

Federated Metals Div., American Smelting and Refining Co., 120 Broadway, New York 5, N. Y.

COPPER SHOT

Federated Metals Div., American Smelting and Refining Co., 120 Broadway, New York 5, N. Y.
Niagara Falls Smelting & Refining Div., Continental-Copper & Steel Industries, Inc., 2200-2214 Elmwood Ave., Buffalo 23, N. Y.
Sipi Metals Co., 1720 N. Elston, Chicago 22, Ill.

CORE BINDERS

Acme Resin Corp., Forest Park, Ill.
American Gum Products Co., 500 Fifth Ave., New York 18, N. Y.
Archer-Daniels-Midland Co., Foundry Products Div., 2191 W. 110th St., Cleveland 2, O.
Bakelite Corp., 300 Madison Ave., New York 17, N. Y.
M. A. Bell Co., 217 Lombard St., St. Louis 2, Mo.
The Borden Co., Thor Division, 350 Madison Ave., New York 17, N. Y.
Cities Service Oil Co., 20 N. Wacker Dr., Chicago 6, Ill.
Corn Products Refining Co., 17 Battery Pl., New York 4, N. Y.
Delta Oil Products Co., Milwaukee 9, Wis.
Durez Plastics & Chemicals Co., North Tonawanda, N. Y.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
General Electric Co., Pittsfield, Mass.
Foundry Rubber Inc., 6100 River Rd., Washington 16, D. C.
Goehringer Foundry Supply Co., 919 West Fifth St., Cincinnati 3, O.
Hercules Powder Co., Wilmington 99, Del.
E. F. Houghton Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.
Monsanto Chemical Co., Plastics Division, Springfield 2, Mass.
Reichhold Chemical Co., 525 North Broadway, White Plains, N. Y.
Robeson Process Co., 500 Fifth Ave., New York 18, N. Y.
Smith Oil & Refining Co., 1102 Kilburn Ave., Rockford, Ill.
Fdereric B. Stevens, Inc., Detroit 16, Mich.
Swan-Finch Oil Corp., 205 East 42nd St., New York 17, N. Y.
Thiem Products Co., 9800 West Rogers, Milwaukee 14, Wis.
United Oil Co., Erie, Pa.
Whitehead Bros. Co., 324 West 23rd St., New York 11, N. Y.

CORE BLOWER BUSHINGS

Eastern Clay Products, Dept. International Minerals & Chemical Corp., 20 N. Wacker Drive, Chicago 6, Ill.

CORE BLOWING MACHINES

Beardsley & Piper Div. Pettibone Mulliken Corp., 2424 N. Cicero, Chicago 39, Ill.
Champion Div. Pettibone Mulliken Corp., 2424 N. Cicero, Chicago 39, Ill.
Wm. Demmler & Bros. Kewanee, Ill.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
International Molding Machine Co., LaGrange Park, Ill.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.
Redford Iron & Equipment Co., 20733 Glendale Ave., Detroit 23, Mich.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

COREBOXES

Accurate Match Plate Co., 1847 W. Carroll St., Chicago, Ill.

CORE COLORING

Eaton Chemical & Dyestuff Co., 1490 Franklin, Detroit, Mich.

CORE DRAWING MACHINES

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Freeman Supply Co., Toledo 5, O.

CORE DRIERS

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Grindle Corp., Harvey, Ill.

CORE GRINDERS (Power Operated)

Jeffrey Mfg. Co., Columbus 16, O.
Milwaukee Foundry Equipment Div., Spo Inc., 3328 Pierce St., Milwaukee 4, Wis.
Sutter Products Co., Dearborn, Mich.

CORE KNOCKOUT MACHINES

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Beardsley & Piper Div. Pettibone-Mulliken Corp., 2424 No. Cicero, Chicago 39, Ill.
Pangborn Corp., Hagerstown, Md.
Simplicity Engineering Co., Durand, Mich.

COREMAKING MACHINES

Beardsley & Piper Div. Pettibone-Mulliken Corp., 2424 N. Cicero, Chicago 39, Ill.
Champion Div. Pettibone-Mulliken Corp., 2424 No. Cicero, Chicago 39, Ill.
Davenport Machine & Foundry Co., Davenport, Iowa.
Wm. Demmler & Bros., Kewanee, Ill.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.
International Molding Machine Co., LaGrange,Park, Ill.
Johnston & Jennings Div. Pettibone-Mulliken Corp., 2424 N. Cicero, Chicago 39, Ill.
Milwaukee Foundry Equipment Div., Spo Inc., 3328 Pierce St., Milwaukee 4, Wis.
Redford Iron & Equipment Co., 20733 Glendale Ave., Detroit 23, Mich.
Sutter Products Co., Dearborn, Mich.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

CORE OILS—See CORE BINDERS

CORE OVEN HEATERS (Electric)

Edwin L. Wiegand Co., 7500 Thomas Blvd., Pittsburgh 8, Pa.

CORE and MOLD OVENS

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
M. A. Bell Co., 217 Lombard St., St. Louis 2, Mo.
Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, O.
Foundry Eqquipment Co., 1831 Columbus Rd., Cleveland 13, O.
Girdler Corp., Thermex Division, 224 E. Broadway, Louisville 2, Ky.
Holcroft & Company, 6545 Epworth Blvd., Detroit 10, Mich.
Industrial Ovens Inc., 13825 Triskett Rd., Cleveland 11, Ohio.
Lanly Company, 750 Prospect Ave., Cleveland 15, O.
Michigan Oven Co., 419 Brainard St., Detroit 1, Mich.
Newcomb-Detroit Co., 5741 Russell St., Detroit 11, Mich.
Frederic B. Stevens, Inc., 18th St. & Vernor Highway, Detroit 16, Mich.
Stroman Furnace & Engineering, Div. of Petersen Oven Co., 9900 Franklin Ave., Franklin Park, Ill.

CORE PASTE

M. A. Bell Co., 217 Lombard St., St. Louis 2, Mo.
Corn Products Refining Co., 17 Battery Pl., New York 4, N. Y.
Delta Oil Products Co., Milwaukee 9, Wis.
Eastern Clay Products, Dept. International Minerals & Chemical Corp., 20 N. Wacker Drive, Chicago 6, Ill.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Frederic B. Stevens, Inc., 18th St. & Vernor Highway, Detroit 16, Mich.
Thiem Products Co., 9800 West Rogers, Milwaukee 14, Wis.
Whitehead Bros. Co., 324 West 23rd St., New York 11, N. Y.

CORE PLATES (Steel, Aluminum, Magnesium, Asbestos)

Black, Sivalls & Bryson, Inc., 7500 E. 12th St., Kansas City 6, Mo.
Christiansen Corp., 210 South Marion, Oak Park 1, Ill.
Champion Division, Pettibone Mulliken Corp., 2424 N. Cicero, Chicago 39, Ill.
Johns-Manville, 22 E. 40th St., New York 16, N. Y.
Pressed Steel Div. Republic Steel Corp., 6100 Truscon Ave., Cleveland, Ohio.
Rock Island Millwork Co., Rock Island, Ill.
Shanafelt Mfg. Co., 3623 Winfield Way, N.E., Canton 5, Ohio.
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

CORE ROD STRAIGHTENING and CUTTING MACHINERY

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

CORE SAND—See SAND

CORE SAND MIXERS—See SAND PREPARATION EQUIPMENT

CORE SPRAYERS

Freeman Supply Co., 1152 East Broadway, Toledo, Ohio.

CORE STRIPPERS—See CORE DRAWING MACHINES

CORE TRUCKS—See TRUCKS (Core)

CORE VENTS

Andrea Mfg. Co., 180 North Wacker Drive, Chicago 6, Ill.
Demmler, Wm., & Bros., Kewanee, Ill.
Smillie, C. M. & Co., 1124 Woodward Heights Blvd., Ferndale 20, Mich.

CORE and MOLD WASH

Acheson Colloids Co., Port Huron, Mich.
Asbury Graphite Mills, Inc., Asbury, N. J.
M. A. Bell Co., 217 Lombard St., St. Louis 2, Mo.
Carborundum Co., Perth Amboy, N. J.
Cities Service Oil Co., 20 N. Wacker Dr., Chicago 6, Ill.
Corn Products Refining Co., 17 Battery Pl., New York City 4.
Delta Oil Products Co., Milwaukee 9, Wis.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Foundry Services, Inc., 260 Madison Avenue, New York 16, N. Y.
Hardy Sand Co., P. O. Box 476, Evansville, Ind.
E. F. Houghton Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.
Mullite Refractories, Shelton, Conn.
National Carbon Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
Pennsylvania Pulverizing Co., 140 Stanwix St., Pittsburgh 22, Pa.
Smith Oil & Refining Co., 1102 Kilburn Ave., Rockford, Ill.
Stevens, Frederic B., Inc., Detroit 26, Mich.
Thiem Products Co., 9800 West Rogers, Milwaukee 14, Wis.
Titanium Alloy Mfg. Div. National Lead Co., Hyde Park Blvd., Niagara Falls, N. Y.
United Oil Co., Erie, Pa.
United States Graphite Co., Saginaw, Mich.
Whitehead Bros. Co., 324 West 23rd St., New York 11, N. Y.

CORE WIRES

Crescent Brass & Pin Co., 5766 Trumbull Ave., Detroit, Mich.

CORES (Strainer, Ceramic)

American Clay Forming Co., Tiffin, Ohio.
Harbison-Walker Refractories Co., 1745 Farmers Bank Bldg., Pittsburgh 22, Pa.
Louthan Corp., East Liverpool, Ohio.
Porcelain Products, Inc., Findlay, Ohio.

COUPLINGS (Air Line)

Aeroquip Corp., Jackson, Mich.
Cleco Division of Reed Roller Bit Co., Houston, Tex.
A. Schrader's Son, 470 Vanderbilt Ave., Brooklyn 17, N. Y.

CRANES (Bucket)

Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CRANES (Gantry)

Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Modern Equipment Co., Port Washington, Wis.
Wellman Engineering Co., 7000 Central Ave., Cleveland 4, Ohio.

CRANES (Jib)

American MonoRail Co., 13104 Athens Ave., Cleveland 7, O.
Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Industrial Crane & Hoist Corp., 315 North Ada St., Chicago 7, Ill.
Modern Equipment Co., Port Washington, Wis.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CRANES (Monorail—Electric and Hand)

American MonoRail Co., 13104 Athens Ave., Cleveland 7, O.
Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.
Erie Strayer Co., Erie, Pa.
Harnischfeger Corp., 4400 W. National Ave., Milwaukee 14, Wis.
Industrial Crane & Hoist Corp., 315 North Ada St., Chicago 7, Ill.
Modern Equipment Co., Port Washington, Wis.
Shepard-Niles Crane & Hoist Corp., 360 Schuyler Ave., Montour Falls, N. Y.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.
Wright Hoist Div., American Chain & Cable Co., Inc., York, Pa.

CRANES (Self-Propelled)

American Steel Dredge Co., Inc., Wayne Crane Division, 2511 Taylor Street, Fort Wayne, Ind.
Baker Raulang Company, 1250 West 80th St., Cleveland 2, Ohio.
Silent Hoist & Crane Co., 835 63rd St., Brooklyn 20, N. Y.

CRAYONS (Marking)

Markal Co., 3052 W. Carroll, Chicago 12, Ill.

CRUCIBLES

American Refractories and Crucible Corp., North Haven, Conn.
Bay State Crucible Co., Taunton, Mass.
M. A. Bell Co., 217 Lombard St., St. Louis 2, Mo.
Dixon, Joseph, Crucible Co., Jersey City, N. J.
Lava Crucible Co., Pittsburgh, Pa.
National Carbon Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
Ross-Tacony Crucible Co., Tacony, Philadelphia, Pa.
Vesuvius Crucible Co., Swissvale, Pa.

CRUCIBLE POURING DEVICES

Modern Equipment Co., Port Washington, Wis.

CRUSHERS (Core)

Newaygo Engineering Co., Newaygo, Mich.
Simplicity Engineering Co., Durand, Mich.

CUPOLAS

The Grindle Corp., 16231 Turner Ave., Harvey, Ill.
Modern Equipment Co., Port Washington, Wis.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CUPOLAS (Hot Blast Equipment)

The Grindle Corp., 16231 Turner Ave., Harvey, Ill.

CUPOLA BLOWERS

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Roots-Connersville Blower Div., Connersville, Ind.
Spencer Turbine Co., Hartford, Conn.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CUPOLA CHARGING MACHINES

American MonoRail Co., 13104 Athens Ave., Cleveland 7, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, O.
Harnischfeger Corp., 4400 W. National Ave., Milwaukee 14, Wis.
Modern Equipment Co., Port Washington, Wis.
Shepard-Niles Crane & Hoist Corp., Montour Falls, N. Y.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CUPOLA CONTROL EQUIPMENT

Foxboro Company, Foxboro, Mass.

CUPOLA DUST ARRESTORS—See DUST COLLECTING, VENTILATING, EXHAUST, COOLING SYSTEMS

CUPOLA LIGHTERS

The Grindle Corp., 16231 Turner Ave., Harvey, Ill.
Hauck Mfg. Co., 106 Tenth St., Brooklyn 15, N. Y.
Hickman-Williams Co., Union Commerce Bldg., Cleveland 14, Ohio.
Whiting Corp., Harvey, Ill.

CUPOLA LININGS—See REFRACTORIES

CUPOLA PATCHING GUNS

Durex Refractories Co., P. O. Box 147, Jackson, Ohio.
Eastern Clay Products Dept. of International Minerals & Chemical Corp., 20 N. Wacker Drive, Chicago 6, Ill.

CUTOFF MACHINES (Abrasive)

Fox Grinders Inc., Oliver Bldg., Pittsburgh, Pa.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

CUTOFF WHEELS

Bay State Abrasive Products Co., Westboro, Mass.
Carborundum Co., Perth Amboy, N. J.
Electro Refractories & Abrasives Corp., Vars Bldg., Buffalo 2, N. Y.
Macklin Company, Jackson, Mich.
Norton Company, Worcester 6, Mass.
Raybestos-Manhattan, Inc., Manhattan Rubber Division, Passaic, N. J.
Simonds Abrasive Co., Tacony & Fraley Sts., Philadelphia 37, Pa.
Sterling Abrasive Division, Cleveland Quarries Co., Tiffin, Ohio

CUTTING OILS

E. F. Houghton Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.

CYLINDERS (Air)

Hanna Engineering Works, 1765 Elston Ave., Chicago 22, Ill.
Miller Fluid Power Co., 2040 North Hawthorne, Melrose Park, Ill.

CYLINDERS (Hydraulic)

Miller Fluid Power Co., 2040 North Hawthorne, Melrose Park, Ill.

DARK ROOM ACCESSORIES—See X-RAY FILM and ACCESSORIES

DEGASIFIERS and DEOXIDIZERS

Carborundum Co., Perth Amboy, N. J.
Cleveland Flux Co., 1026 Main St., Cleveland 13, O.
Federated Metals Div., American Smelting and Refining Co., 120 Broadway, New York 5, N. Y.
Foundry Services, Inc., 260 Madison Avenue, New York 16, N. Y.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
National Pigment Co., Orthodox St. at Delaware River, Philadelphia 37, Pa.
Niagara Falls Smelting & Refining Div., Continental-Copper & Steel Industries, Inc., 2200-2214 Elmwood Ave., Buffalo 23, N. Y.
Pittsburgh Metals Purifying Co., 1352 Marvista St., Pittsburgh 12, Pa.

DESULPHURIZERS

Cleveland Flux Co., 1026 Main St., Cleveland 13, O.
Columbia-Southern Chemical Corp., Div., Pittsburgh Plate Glass Co., Pittsburgh 19, Pa.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Hercules Powder Co., Wilmington 99, Del.
Mathieson Chemical Corp., 60 Mathieson Bldg., Baltimore 3, Md.
Modern Equipment Co., Port Washington, Wis.
National Pigment Co., Orthodox St. at Delaware River, Philadelphia 37, Pa.
Pittsburgh Metals Purifying Co., 1352 Marvista St., Pittsburgh 12, Pa.
Solvay Process Division Allied Chemical & Dye Corp., 61 Broadway, New York 6, N. Y.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

DIE CASTING MACHINES

Kux Machine Co., 6725 North Ridge Ave., Chicago 26, Ill.

DOWEL PINS

Standard Horse Nail Corp., New Brighton, Pa.

DRILLS (Electric)

Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh 8, Pa.
Mall Tool Co., 7740 So. Chicago Ave., Chicago 19, Ill.
Standard Electrical Tool Co., 2488 River Road, Cincinnati 4, Ohio.

DRILLS (Pneumatic)

Gardner-Denver Co., Quincy, Ill.
Schramm Inc., West Chester, Pa.

DRUMS (Magnetic)—See SEPARATORS (Magnetic)

DUMP HOPPERS

Roura Iron Works, 1405 Woodland Ave., Detroit 11, Mich.

DUMP TRUCKS

Frank G. Hough Co., Libertyville, Ill.
Kwik-Mix Co., 3026 West Concordia, Milwaukee 16, Wis.
Prime Mover Co., Muscatine, Iowa.
Tractomotive Corp., Deerfield, Ill.

DUST COLLECTING, VENTILATING, EXHAUST, COOLING SYSTEMS

American Air Filter Co., Inc., 266 Central Ave., Louisville 8, Ky.

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Bartlett & Snow, C. O., Co., 6201 Harvard Ave., Cleveland 5, O.
Dust Suppression & Engineering Co., Lake Orein, Michigan.
The Grindle Corp., 16231 Turner Ave., Harvey, Ill.
Joy Mfg. Co., Henry W. Oliver Bldg., Pittsburgh 22, Pa.
Macleod Co., P. O. Box 452, Sharonsville, Ohio.
Metals Disintegrating Co., Inc., Pulverizing Machinery Div., Chatham Rd., Summit, New Jersey
Newcomb-Detroit Co., 5741 Russell St., Detroit 11, Mich.
Pangborn Corp., Hagerstown, Md.
Robbins & Myers Inc., Propellair Div., Springfield, O.
Schneible Co., Claude B., 212 Stephenson Bldg., P.O. Box 81, North End Station, Detroit 2, Mich.
W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2, Ohio.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

DUST CONTROL AGENTS

Aquadyne Corp., 441 Lexington Ave., New York 17, N. Y.

DYES & CHEMICALS

Eaton Chemical & Dyestuff Co., 1490 Franklin, Detroit, Mich.

ELECTRIC FURNACES (See Furnaces, Electric)

ELECTRODES (Graphite and Amorphous)

Great Lakes Carbon Corp., Hancock Bldg., Niagara Falls, N. Y.
National Carbon Co., Inc., Electrode Sales Div., 30 E. 42nd St., New York 17, N. Y.

ELEVATORS (Bucket)

Bartlett & Snow, C. O., Co., 6201 Harvard Ave., Cleveland 5, O.
Great Western Mfg. Co., Leavenworth, Kansas.
Jeffrey Mfg. Co., Columbus 16, O.
Link-Belt Co., 307 North Michigan Ave., Chicago 1, Ill.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Newaygo Engineering Co., Newaygo, Mich.
Robins Conveyors Div., Hewitt-Robins Inc., 270 Passaic Ave., Passaic, N. J.

ELEVATORS (Pneumatic, Material Handling)

Fuller Co., Catasauqua, Pa.

ENGINEERING SERVICE (Foundry)

Edwin S. Carman, 1643 Lee Road, Cleveland 18, Ohio.
Giffels & Vallet, Inc. Marquette Bldg., Detroit, Mich.
Lester B. Knight & Associates, Inc., 600 West Jackson Blvd., Chicago 3, Ill.
Reece, H. A. & Associates, 960 Union Commerce Bldg., Cleveland 14, Ohio.
Westover Engineers, 3110 W. Fond du Lac Avenue, Milwaukee 10, Wis.

EXHAUST—See DUST COLLECTING, VENTILATING, EXHAUST, COOLING SYSTEMS

FABRICATORS (Metal)

Newaygo Engineering Co., Newaygo, Mich.
Penn Iron Works, Inc., Reading, Pa.
Roura Iron Works, 1405 Woodland Ave., Detroit 11, Mich.

FACINGS

Acheson Colloids Co., Port Huron, Mich.
Asbury Graphite Mills, Inc., Asbury, N. J.
M. A. Bell Co., 217 Lombard St., St. Louis 2, Mo.
Delta Oil Products Co., Milwaukee 9, Wis.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
National Carbon Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
Stevens Inc., Frederic B., Detroit 16, Mich.
United States Graphite Co., Saginaw, Mich.
Whitehead Bros. Co., 324 West 23rd St., New York 11, N. Y.

FANS—See DUST COLLECTING, VENTILATING, EXHAUST, COOLING SYSTEMS

FASTENERS (Conveyor Belt)

Flexible Steel Lacing Co., 4667 Lexington St., Chicago 44, Illinois.

FEEDERS (Belt)

Bartlett & Snow Co., C. O., 6201 Harvard Ave., Cleveland 5, O.
Link-Belt Company, 307 North Michigan Ave., Chicago 1, Ill.
Robins Conveyors, Div. Hewitt-Robins Inc., 270 Passaic Ave., Passaic, N. J.

FEEDERS (Rotary)

Bartlett & Snow Co., C. O., 6201 Harvard Ave., Cleveland 5, O.
Fuller Company, Catasauqua, Pa.
Great Western Mfg. Co., Leavenworth, Kansas.
Link-Belt Co., 307 North Michigan Ave., Chicago 1, Ill.
Newaygo Engineering Co., Newaygo, Mich.

FEEDERS (Vibrating)

Bartlett & Snow Co., C. O., 6201 Harvard Ave., Cleveland 5, O.
Jeffrey Mfg. Co., 907 N. Fourth St., Columbus 16, O.
Link-Belt Company, 307 North Michigan Ave., Chicago 1, Ill.
Robins Conveyors, Div. Hewitt-Robins Inc., 270 Passaic Ave., Passaic, N. J.

FERROBORON

Electro Metallurgical Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
Molybdenum Corp. of America, Pittsburgh 19, Pa.

FERROCHROME

Electro Metallurgical Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
Hickman-Williams & Co., Cleveland, O.
Ohio Ferro-Alloys Corp. Canton 9, O.
Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

FERROCOLUMBIUM

Electro Metallurgical Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

FERROMANGANESE

Electro Metallurgical Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
Ohio Ferro-Alloys Corp., Canton 9, O.

FERROMOLYBDENUM

Molybdenum Corporation of America, Pittsburgh 19, Pa.

FERROSILICON

Electro Metallurgical Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
Globe Iron Co., Jackson, Ohio.
Keokuk Electro Metals Co., 429 So. 4th St., Keokuk, Iowa.
Miller & Company, 332 S. Michigan Ave., Chicago 4, Ill.
Ohio Ferro-Alloys Corp., Canton 9, O.
Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

FERROTITANIUM

Electro Metallurgical Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
Titanium Alloy Mfg. Div. National Lead Co., Hyde Park Blvd., Niagara Falls, N. Y.
Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

FERROTUNGSTEN

Electro Metallurgical Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
Molybdenum Corp. of America, Pittsburgh 19, Pa.

FERROVANADIUM

Electro Metallurgical Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

FILTERS (Air)

American Air Filter Co., 266 Central Ave., Louisville 8, Ky.

FIRE BRICK, CLAY, SAND, STONE—See REFRACTORIES

FLASK BANDS—See BANDS (Snap Flask)

FLASK BUSHINGS, PINS and FITTINGS

The Adams Co., Dubuque, Iowa.
Black, Sivalls & Bryson, Inc., 7500 E. 12th St., Kansas City 6, Mo.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.
Pressed Steel Div., Republic Steel Corp., 6100 Truscon Ave., Cleveland, Ohio.
Shanafelt Mfg. Co., 3623 Winfield Way, N. E., Canton 5, Ohio.
Smillie & Co., C. M., 1124 Woodward Hgts. Blvd., Ferndale 20, Mich.
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.
Universal Engineering Co., Frankenmuth, Mich.

FLASK FILLERS

Bartlett & Snow, C. O., Co., 6201 Harvard Ave., Cleveland 5, Ohio.
Beardsley & Piper Div. Pettibone Mulliken Corp., 2424 No. Cicero, Chicago 39, Ill.
Jeffrey Mfg. Co., Columbus 16, O.

FLASK LIFT MACHINES—See PATTERN DRAW MACHINES

FLASKS (Aluminum, Magnesium)

Adams Co., Dubuque, Iowa.
Fremont Flask Co., Fremont, O.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.

FLASKS (Slip)

Adams Co., Dubuque, Iowa
Freeman Supply Co., 1152 East Broadway, Toledo, Ohio.
Fremont Flask Co., Fremont, O.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.

FLASKS (Snap)

Adams Co., Dubuque, Iowa.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, Ohio.
Fremont Flask Co., Fremont, O.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.
Stevens, Inc., Frederic B., Detroit 16, Mich.

FLASKS (Steel)

Black, Sivalls & Bryson, Inc., 7500 E. 12th St., Kansas City 6, Mo.
Pressed Steel Div., Republic Steel Corp., 6100 Truscon Ave., Cleveland, Ohio.
Shanafelt Mfg. Co., 3623 Winfield Way, N. E., Canton 5, Ohio.
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

FLASKS (Wood)

Adams Co., Dubuque, Iowa.

FLEXIBLE COUPLINGS

Ajax Flexible Coupling Co., Westfield, N. Y.
Link Belt Company, 307 North Michigan Ave., Chicago 1, Ill.

FLOORING

Norton Co., Worcester 6, Mass.

FLUXES

Apex Smelting Co., 2537 West Taylor St., Chicago 12, Ill.
Cleveland Flux Co., 1026 Main St., Cleveland 13, Ohio.
Foundry Services, Inc., 260 Madison Avenue, New York 16, N. Y.
Mathieson Chemical Corp., Mathieson Bldg., Baltimore 3, Md.
National Pigment Co., Orthodox St. at Delaware River, Philadelphia 37, Pa.
Niagara Falls Smelting & Refining Div., Continental-Copper & Steel Industries Inc., 2200-2214 Elmwood Ave., Buffalo 23, N. Y.
Pittsburgh Metals Purifying Co., 1352 Marvista St., Pittsburgh 12, Pa.

FLUXES (Soldering, Welding & Tinning)

Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

FOUNDRY ENGINEERS (See ENGINEERING SERVICE)

FOUNDRY LAYOUT & METHODS (See ENGINEERING SERVICE)

FOUNDRY NAILS

Crescent Brass & Pin Co., 5766 Trumbull Ave., Detroit, Mich.
Standard Horse Nail Corp., New Brighton, Pa.

FOUNDRY SUPPLY HOUSES

M. A. Bell Co., 217 Lombard St., St. Louis 2, Mo.
Combined Supply & Equipment Co., Inc., 215 Chandler St., Buffalo 7, N. Y.
Eastern Clay Products, Dept. International Minerals & Chemical Corp., 20 N. Wacker Drive, Chicago 6, Ill.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Stevens, Inc., Frederic B., Detroit 16, Mich.
Thiem Products Co., 9800 West Rogers, Milwaukee 14, Wis.

FURNACE BLOWERS—See BLOWERS

FURNACE LININGS—See REFRACTORIES

FURNACES (Air)

Grindle Corp., 16231 Turner Ave., Harvey, Ill.
Holcroft & Co., 6545 Epworth Blvd., Detroit 10, Mich.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

FURNACES, (Electric Melting)

Ajax Electrothermic Corp., Trenton, N. J.
Ajax Engineering Corp., Trenton, N. J.
American Bridge Co., Div. United States Steel Corp., 525 Wm. Penn Place, Pittsburgh 19, Pa.
Detroit Electric Furnace Div. of Kuhlman Electric Co., Bay City, Mich.
Ohio Crankshaft Co., Tocco Division, 4620 E. 71st St., Cleveland 5, Ohio.
Pittsburgh Lectromelt Furnace Corp., P.O. Box 1125, Pittsburgh, Pa.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

FURNACES (Gas or Oil Fired Melting)

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Campbell-Hausfeld Co., Harrison, O
Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.
Electric Furnace Co., West Wilson St., Salem, Ohio.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio
Holcroft & Company, 6545 Epworth Blvd., Detroit 10, Mich.
Johnston Mfg. Co., Minneapolis 13, Minn.
Lanly Company, 750 Prospect Ave., Cleveland 15, Ohio.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.
Lobdell United Co., 2000 G Street, Wilmington 99, Del.
Reda Pump Co., Bartlesville, Okla.
Stroman Furnace & Engineering Co., Div. of Peterson Oven Co., 9900 Franklin Ave., Franklin Park, Ill

FURNACES (Heat Treating and Annealing)

Ajax Electric Co., Inc., Philadelphia 23, Pa.
Ajax Electrothermic Corp., Trenton, N. J.
Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.
Electric Furnace Co., West Wilson St., Salem, Ohio.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio
General Electric Co., Schenectady, N. Y.
The Grindle Corp., 16231 Turner Ave., Harvey, Ill
Holcroft & Company, 6545 Epworth Blvd., Detroit 10, Mich.
Industrial Ovens Inc., 13825 Triskett Rd., Cleveland 11, Ohio.
Johnston Mfg. Co., Minneapolis 13, Minn.
Lanly Company, 750 Prospect Ave., Cleveland 15, Ohio.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.
Lobdell United Co., 2000 G Street, Wilmington 99, Del.
Ohio Crankshaft Co., Tocco Division, 4620 E. 71st St., Cleveland 5, Ohio.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

GAGGERS

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O

GAS (Oxygen, Acetylene, Industrial)

Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y.
Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

GAS BURNERS—See BURNERS

GENERATORS (Acetylene)

Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

GLOVES—See SAFETY CLOTHING

GOGGLES and EYE PROTECTORS

American Optical Co., Southbridge, Mass.

M. A. Bell Co., 217 Lombard St., St. Louis 2, Mo.
Chicago Eye Shield Co., 2300 West Warren, Chicago 12, Ill.
Willson Products Inc., Reading, Pa.

GRAPHITE and GRAPHITE BRIQUETS

Acheson Colloids Co., Port Huron, Mich.
Asbury Graphite Mills Inc., Asbury, N. J.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Great Lakes Carbon Corp., Hancock Bldg., Niagara Falls, N. Y.
National Carbon Co. Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
Frederic B. Stevens, Inc., Detroit 16, Mich.
United States Graphite Co., Saginaw, Mich.

GRINDERS (Electric Portable)

Bradford Machine Tool Co., 657 Evans St., Cincinnati 4, Ohio.
Buckeye Tools Corp., 29 West Apple St., Dayton 2, Ohio.
Chicago Pneumatic Tool Co., 6 East 44th St., New York 17, N. Y.
Chicago Wheel & Mfg. Co., 1101 W. Monroe, Chicago 7, Ill.
Mall Tool Co., 7740 So. Chicago Ave., Chicago 19, Ill.
Rotor Tool Co., 26300 Lakeland Blvd., Cleveland 23, Ohio.
Standard Electrical Tool Co., 2488 River Road, Cincinnati 4, Ohio.

GRINDERS (Flexible Shaft)

Chicago Wheel & Mfg. Co., 1101 W. Monroe, Chicago 7, Ill.
Mall Tool Co., 7740 So. Chicago Ave., Chicago 19, Ill.

GRINDERS (Pneumatic Portable)

Buckeye Tools Corp., 29 West Apple St., Dayton 2, Ohio.
Chicago Pneumatic Tool Co., 6 East 44th St., New York 17, N. Y.
Cleco Pneumatic Tool Div., Reed Roller Bit Co., Houston, Tex.
Keller Tool Co., Grand Haven, Michigan.
Master Pneumatic Tool Co., Inc., Orwell, Ohio.
Rotor Tool Co., 26300 Lakeland Blvd., Cleveland 23, Ohio.

GRINDERS (Surface, Bench, Disc, Floor)

Bradford Machine Tool Co., 657 Evans St., Cincinnati 4, Ohio.
Chicago Wheel & Mfg. Co., 1101 W. Monroe, Chicago 7, Ill.
Fox Grinders Inc., Oliver Bldg., Pittsburgh 22, Pa.
Lobdell-United Co., 2000 G Street, Wilmington 99, Del.
Mall Tool Co., 7740 So. Chicago Ave., Chicago 19, Ill.
Standard Electrical Tool Co., 2488 River Road, Cincinnati 4, Ohio.

GRINDERS (Swing Frame)

Fox Grinders, Inc., Oliver Bldg., Pittsburgh 22, Pa.
Sutter Products Co., Dearborn, Mich.

GRINDING WHEELS

Bay State Abrasive Products Co., Westboro, Mass.
Bradford Machine Tool Co., 657 Evans St., Cincinnati 4, Ohio.
Carborundum Co., Niagara Falls, N. Y.
Chicago Wheel & Mfg. Co., 1101 W. Monroe, Chicago 7, Ill.
Cincinnati Milling Machine Co., Cincinnati 9, Ohio
Cleveland Quarries Co., Amherst, O.
Macklin Company, Jackson, Mich.
Mid West Abrasive Co., Owosso, Michigan.
Norton Company, Worcester 6, Mass.
Peninsular Grinding Wheel Co., 729 Meldrum Ave., Detroit, Mich.
Raybestos-Manhattan, Inc., Manhattan Rubber Division, Passaic, N. J.
Simonds Abrasive Co., Tacony & Fraley Sts., Philadelphia 37, Pa.
Sterling Abrasive Division, Cleveland Quarries Co., Tiffin, Ohio.
United States Rubber Co., 4300 New Haven Ave., Fort Wayne 4, Ind.

GRINDING WHEEL DRESSERS

Carborundum Co., Niagara Falls, N. Y.
Chicago Wheel & Mfg. Co., 1101 W. Monroe, Chicago 7, Ill.
Desmond-Stephen Mfg. Co., Urbana, O.

GRINDSTONES—See GRINDING WHEELS

GRIT—See SHOT and GRIT

HAMMERS (Chipping)—See PNEUMATIC TOOLS and CHISELS

HARDNESS TESTING EQUIPMENT

Detroit Testing Machine Co., 19390 Grinnell Ave., Detroit 13, Mich.
Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.

HEAT CONTROL AND RECORDING DEVICES

Claude S. Gordon Co., 3000 So. Wallace, Chicago 16, Ill.
The Grindle Corp., 16231 Turner Ave., Harvey, Ill.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.
Marshall Co., L. H., 270 W. Lane, Columbus 1, O.

HEATERS (Space, Unit, Oven, Water)

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Drying Systems Inc., 1800 W. Foster Ave., Chicago 40, Ill.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
Lanly Co., 750 Prospect Ave., Cleveland 15, Ohio.
Herman Nelson Division, American Air Filter Co., Inc., Louisville 8, Kentucky.
Newcomb-Detroit Co., 5741 Russell St., Detroit 11, Mich.
Silent Glow Oil Burner Corp., Hartford, Conn.
Edwin L. Wiegand Co., 7500 Thomas Blvd., Pittsburgh 8, Pa.

HEATERS (High Frequency Electric)

Ajax Electrothermic Corp., Trenton, N. J.

HELMETS (Blasting)

American Wheelabrator & Equipment Co., Mishawaka, Ind.
American Optical Co., Southbridge, Mass.
Pangborn Corp., Hagerstown, Md.
W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2, Ohio.

HELMETS (Welding)

American Optical Co., Southbridge, Mass.

HOISTS (Air)

Chicago Pneumatic Tool Co., 6 East 44th St., New York 17, N. Y.
Curtis Pneumatic Machinery Div. Curtis Mfg. Co., 1905 Kienlen Ave., St. Louis 20, Mo.
Gardner-Denver Co., Quincy, Ill.
Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.
Joy Mfg. Co., Henry W. Oliver Bldg., Pittsburgh 22, Pa.
Keller Tool Co., Grand Haven, Michigan.
Miller Fluid Power Co., 2040 North Hawthorne, Melrose Park, Ill.

HOISTS (Chain, Hand)

Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.
Manning, Maxwell & Moore, Inc., Muskegon, Mich.
Wright Hoist Div., American Chain & Cable Co., Inc., York, Pa.

HOISTS (Electric)

Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.
Harnischfeger Corp., 4400 W. National Ave., Milwaukee 14, Wis.
Joy Mfg. Co., Henry W. Oliver Bldg., Pittsburgh 22, Pa.
Manning, Maxwell & Moore, Inc., Muskegon, Mich.
Modern Equipment Co., Port Washington, Wis.
Shepard-Niles Crane & Hoist Corp., Montour Falls, N. Y.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.
Wright Hoist Div., American Chain & Cable Co., Inc., York, Pa.

HOISTS (Skip)

Beardsley & Piper Div., Pettibone Mulliken Corp., 2424 No. Cicero, Chicago 39, Ill.
Gardner-Denver Co., Quincy, Ill.
Link Belt Co., 307 North Michigan Ave., Chicago 1, Ill.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Newaygo Engineering Co., Newaygo, Mich.
Robins Conveyors Div., Hewitt-Robins Inc., 270 Passaic Ave., Passaic, N. J.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

HOODS (Shakeout, Pouring & Cooling)—See DUST COLLECTING, VENTILATING, EXHAUST, COOLING SYSTEMS

HOSE (Air, Blasting, Water, Gas)

Gardner-Denver Co., Quincy, Ill.
Hewitt Rubber Div., Hewitt-Robins Div., Inc., 240 Kensington Ave., Buffalo 5, N. Y.
Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.
Pangborn Corp., Hagerstown, Md.
Raybestos-Manhattan, Inc., Manhattan Rubber Div., Passaic, N. J.
Schramm Inc., West Chester, Pa.

HOSE FITTINGS and REELS

Aeroquip Corp., Jackson, Mich.
A. Schrader's Son, 417 Vanderbilt Ave., Brooklyn 17, N. Y.

HYDRAULIC CLEANING—See BLAST CLEANING EQUIPMENT

IDENTIFICATION PENCILS

Markal Co., 3052 W. Carroll, Chicago 12, Ill.

IMPREGNATING SYSTEMS and CASTING SEALER

The Patterson-Kelley Co. Inc., East Stroudsburg, Pa.
Tincher Products Co., Sycamore, Ill.
Tousey Varnish Co., 520 West 25th St., Chicago 16, Ill.

INGOT MOLDS

Acme Foundry Co., Detroit 16, Mich.
Great Lakes Carbon Corp., Hancock Bldg., Niagara Falls, N. Y.
National Carbon Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

INGOTS—(See type of metal)

INOCULANTS

Carborundum Co., Perth Amboy, N. J.
United States Graphite Co., Saginaw, Mich.

IRON CEMENT

Smooth-On Mfg. Co., 570 Communipaw Ave., Jersey City 4, N. J.

IRON ORE

Pickands, Mather & Co., Cleveland 14, O.

IRON OXIDES

Delta Oil Products Co., Milwaukee 9, Wis.
Tamms Industries Inc., 228 No. La Salle St., Chicago 1, Ill.
Thiem Products Co., 9800 West Rogers, Milwaukee 14, Wis.

JACKETS (Mold)—See MOLD JACKETS

LABORATORY EQUIPMENT (Chemical)

Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.
Great Western Mfg. Co., Leavenworth, Kansas.

LABORATORY EQUIPMENT (Physical)

Buehler Ltd., 2120 Greenwood Ave., Evanston, Ill.
Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.
Claude S. Gordon Co., 3000 So. Wallace, Chicago 16, Ill.
Great Western Mfg. Co., Leavenworth, Kansas.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Norton Co., Worcester 6, Mass.

LADLES

Grindle Corp., 16231 Turner Ave., Harvey, Ill.
Industrial Equipment Co., Minster, O.
Modern Equipment Co., Port Washington, Wis.
Frederic B. Stevens, Inc., Detroit 16, Mich.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

LADLE LININGS—See REFRACTORIES

LEAD

Federated Metals Div., American Smelting and Refining Co., 120 Broadway, New York 5.

LIFT TRUCKS (See Trucks, Power Lift)

LINSEED OIL

Hercules Powder Co., Wilmington 99, Del.
United Oil Co., Erie, Pa.

LITHIUM

Lithium Corp. of America, Rand Tower, Minneapolis, Minn.

LOADERS

Barber-Green Co., Aurora, Ill.
Clearfield Machine Co., Clearfield, Pa.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.

LOADERS (Front-End)

Baker-Lull Corp., 314 West 90th St., Minneapolis 20, Minn.
Frank G. Hough Co., Libertyville, Ill.

LUBRICATING SYSTEMS (Crane)

Blaw-Knox Co., Farmers Bank Bldg., Pittsburgh, Pa.

LUBRICANTS (Industrial)

Acheson Colloids Co., Port Huron, Mich.
Smith Oil & Refining Co., 1102 Kilburn Ave., Rockford, Ill.
Swan-Finch Oil Corp., 205 East 42nd St., New York 17, N. Y.
United Oil Mfg. Co., Erie, Pa.
United States Graphite Co., Saginaw, Mich.

MACHINE KEYS

Standard Horse Nail Corp., New Brighton, Pa.

MAGNESIUM INGOTS

Apex Smelting Co., 2537 West Taylor St., Chicago 12, Ill.
Christiansen Corp., 210 South Marion, Oak Park 1, Ill.
Federated Metals Division of American Smelting and Refining Co., 120 Broadway, New York 5, N. Y.

MAGNET CONTROLLERS

Ohio Electric Mfg. Co., 5400 Dunham Rd., Maple Heights, Ohio.

MAGNETS

Dings Magnetic Separator Co., 4740 Electric Ave., Milwaukee 7, Wis.
Homer Mfg. Co., Lima, Ohio.
Jaeger Machine Co., Columbus 16, Ohio.
Ohio Electric Mfg. Co., 5400 Dunham Rd., Maple Heights, Ohio.
Stearns Magnetic Mfg. Co., 635 S. 28th St., Milwaukee 46, Wis.

MANGANESE (Briquets)

Electro Metallurgical Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
Ohio Ferro-Alloys Corp., Canton 2, Ohio.

MARKING CRAYONS

Markal Co., 3052 W. Carroll, Chicago 12, Ill.

MATCHPLATE METAL

Federated Metals Division of American Smelting and Refining Co., 120 Broadway, New York 5, N.Y.

MATCHPLATES

Accurate Match Plate Co., 1847 W. Carroll St., Chicago, Ill.
Champion Div. Pettibone Mulliken Corp. 2424 N. Cicero, Chicago 39, Ill.
City Pattern Foundry & Machine Co., 1165 Harper, Detroit 11, Mich.
Hines Flask Co., 3431 W. 140 St., Cleveland 11, Ohio
Scientific Cast Products Corp., 1388-92 E. 40 St., Cleveland 3, O.

MELTING POTS

Acme Foundry Co., Detroit 16, Mich.

METAL CLEANING—See BLAST CLEANING EQUIPMENT

METALLOGRAPHIC EQUIPMENT

Buehler Ltd., 2120 Greenwood Ave., Evanston, Ill.
Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.

METALLURGICAL CHEMISTS

Chas. C. Kawin Co., 431 S. Dearborn St., Chicago 5, Ill.

METALLURGISTS

Crobaugh Co., Frank L., 1426 West Third St., Cleveland 13, Ohio.

METERS (Gas, Air, Water)

Illinois Testing Laboratories, Inc., 418 N. LaSalle St., Chicago 10, Ill.
Roots-Connersville Blower Div., Connersville, Ind.

MICROSCOPES

Buehler Ltd., 2120 Greenwood Ave., Evanston, Ill.

MIXERS (Core Wash)

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

MIXERS (Sand and Clay)—See SAND PREPARATION EQUIPMENT

MOLD CONVEYORS — See CONVEYORS (Mold)

MOLD DRYERS

Burdett Mfg. Co., 3433 W. Madison, Chicago 7, Ill.
Hauck Mfg. Co., 106 Tenth St., Brooklyn 15, N. Y.
Edwin L. Wiegand Co., 7500 Thomas Blvd., Pittsburgh 8, Pa.

MOLD JACKETS

Adams Co., Dubuque, Iowa.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Fremont Flask Co., Fremont, O.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.

MOLD OVENS—See Core and MOLD OVENS

MOLD SEAL COMPOUND

Whitehead Bros. Co., 324 West 23rd St., New York 11, N. Y.

MOLD WASH—See CORE and MOLD WASH

MOLDING MACHINES

Adams Co., Dubuque, Iowa.
Beardsley & Piper Div. Pettibone Mulliken Corp., 2424 N. Cicero, Chicago 39, Ill.
Champion Div. Pettibone Mulliken Corp., 2424 N. Cicero, Chicago 39, Ill.
Davenport Machine & Foundry Co., Davenport, Iowa.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.
International Molding Machine Co., LaGrange Park, Ill.
Johnston & Jennings Div., Pettibone-Mulliken Corp., 2424 No. Cicero Ave., Chicago 39, Ill.
Milwaukee Foundry Equipment Div., Spo Inc., 3328 W. Pierce St., Milwaukee 4, Wis.
Nicholls, Wm. H., Co., Richmond Hill, Long Island 18, N. Y.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.
S. P. O. Incorporated, 7500 Grand Division Ave., Cleveland 5, O.
Sutter Products Co., Dearborn, Mich.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

MOLDING SANDS—See SAND

MOLYBDENUM

Molybdenum Corporation of America, Pittsburgh 19, Pa.

MONORAIL SYSTEMS—See CONVEYORS (Overhead Monorail)

MOTORS (Electric)

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Ohio Electric Mfg. Co., 5400 Dunham Rd., Maple Heights, Ohio.

MOUNTING PADS

Fabreeka Products, Inc., 222 Summer St., Boston 10, Mass.

MULLERS—See SAND PREPARATION EQUIPMENT

NAILS (Chill)

Crescent Brass & Pin Co., 5766 Trumbull Ave., Detroit, Mich.
Republic Steel Corp., 3100 E. 45th St., Cleveland 4, Ohio.
Standard Horse Nail Corp., New Brighton, Pa.

NICKEL

International Nickel Co., Inc., 67 Wall St., New York City 5.

NITROGEN—See GAS

NONDESTRUCTIVE TESTING

Magnaflux Corp., 7300 West Lawrence Ave., Chicago 31, Ill.

NOZZLES (Blasting)

Alloy Metal Abrasives Co., 311 W. Huron St., Ann Arbor, Mich.
American Wheelabrator & Equipment Co., 505 S. Byrkit St., Mishawaka, Ind.
Carborundum Co., Perth Amboy, N. J.
Davenport Machine & Foundry Co., Davenport, Iowa.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Norton Co., Worcester 6, Mass.
Pangborn Corp., Hagerstown, Md.
W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2, Ohio.

OIL BURNERS—See BURNERS

OPEN HEARTH DOORS

Wm. M. Bailey Co., Pittsburgh 16, Pa.

OPTICAL PYROMETERS—See PYROMETERS

OVENS (Annealing and Heat Treating)—See FURNACES (Heat Treating and Annealing)

OVENS (Core) (See CORE OVENS)

OVENS (Enameling, Japanning)

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Despatch Oven Co., Minneapolis 14, Minn.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
Industrial Ovens Inc., 13825 Triskett Rd., Cleveland 11, Ohio.
Lanly Co., 750 Prospect Ave., Cleveland 15, Ohio.
Michigan Oven Co., 419 Brainard, Detroit 1, Mich.

OVENS (Mold Drying)—See CORE and MOLD OVENS

OXYGEN—See GAS

PARTING COMPOUNDS

Acheson Colloids Co., Port Huron, Mich.
Delta Oil Products Co., Milwaukee 9, Wis.
Dow Corning Corp., Midland, Mich.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
E. F. Houghton Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.
Injection Molder Supply Co., 3514 Lee Rd., Cleveland 20, Ohio.
Smith Oil & Refining Co., 1102 Kilburn Ave., Rockford, Ill.
Frederic B. Stevens, Inc., Detroit 16, Mich.
Tamms Industries Inc., 228 N. LaSalle St., Chicago 1, Ill.
Thien Products Co., 9800 West Rogers, Milwaukee 14, Wis.
United Oil Co., Erie, Pa.
Whitehead Bros. Co., 324 West 23rd St., New York 11, N. Y.

PATTERN COATINGS

Acheson Colloids Co., Port Huron, Mich.
M. A. Bell Co., 217 Lombard St., St. Louis 2, Mo.
Foundry Rubber Inc., 6100 River Rd., Washington 16, D. C.

PATTERN COMPOUND

Tamms Industries Inc., 228 N. LaSalle St., Chicago 1, Ill.

PATTERN DRAW MACHINES

The Adams Co., Dubuque, Iowa.
Beardsley & Piper Div. Pettibone Mulliken Corp., 2424 N. Cicero, Chicago 39, Ill.
Champion Div. Pettibone Mulliken Corp., 2424 N. Cicero, Chicago 39, Ill.
Davenport Machine & Foundry Co., Davenport, Iowa.
Hanna Engineering Works, 1765 Elston Ave., Chicago 22, Ill.
International Molding Machine Co., LaGrange Park, Ill.
Milwaukee Foundry Equipment Div., Spo Inc., 3238 W. Pierce St., Milwaukee 4, Wis.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

PATTERN LETTERS

Freeman Supply Co., 1152 East Broadway, Toledo, Ohio.

PATTERN LUMBER

Freeman Supply Co., 1152 East Broadway, Toledo, Ohio.
Rietz Lumber Co., 1814 N. Central Park Ave., Chicago 47, Ill.

PATTERN METAL

Federated Metals Division of American Smelting and Refining Co., 120 Broadway, New York 5, N.Y.
Niagara Falls Smelting & Refining Div., Continental-Copper & Steel Industries Inc., 2200-2214 Elmwood Ave., Buffalo 23, New York.

PATTERN PLATES—See PATTERNS and PATTERN PLATES (Wood, Metal)

PATTERN SHOP EQUIPMENT

Chicago Wheel & Mfg. Co., 1101 W. Monroe Chicago 7, Ill.
Freeman Supply Co., 1152 East Broadway, Toledo, Ohio.
Oliver Machinery Company, Grand Rapids 2, Mich.

PATTERNS and PATTERN PLATES (Wood, Metal)

Accurate Match Plate Co., 1847 W. Carroll St., Chicago, Ill.
Anderson Pattern Inc., Muskegon Heights, Mich.
Automotive Pattern Co., 1884 John R. Street, Detroit 3, Michigan.
Buffalo Pattern Corp., 830 Hertel Ave., Buffalo, N. Y.
Champion Div. Pettibone Mulliken Corp., 2424 N. Cicero, Chicago 39, Ill.
City Pattern Foundry & Machine Co., 1165 Harper, Detroit 11, Mich.
Danko Pattern & Mfg. Co. Inc., 4700 East Wabash Ave., Baltimore 1, Md.
Freeman Supply Co., 1152 East Broadway, Toledo, Ohio.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.
Master Pattern Co., 1315 Main Ave., Cleveland, O.
Rock Island Millwork Co., Rock Island, Ill.
S.P.O. Incorporated, 7500 Grand Division Ave., Cleveland 5, O.
Scientific Cast Products Corp., 1388-92 E. 40th St., Cleveland 3, O.
Wellman Bronze & Aluminum Co., 12800 Shaker Blvd., Cleveland 20, Ohio.

PERMANENT MOLDS

Centrifugal Casting Machine Co., Tulsa, Okla.
Great Lakes Carbon Corp., Hancock Bldg., Niagara Falls, N. Y.
Master Pattern Co., 1315 Main Ave., Cleveland, O.
National Carbon Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

PHOSPHOR COPPER

Federated Metals Division of American Smelting and Refining Co., 120 Broadway, New York 5, N.Y.
Niagara Falls Smelting & Refining Div., Continental-Copper & Steel Industries Inc., 2200-2214 Elmwood Ave., Buffalo 23, New York.

PHOTOGRAPHIC EQUIPMENT

Eastman Kodak Co., Rochester, N. Y.

PIG CASTING MACHINES

Wm. M. Bailey Co., Pittsburgh 16, Pa.

PIG IRON

Globe Iron Co., Jackson, Ohio.
Hickman-Williams & Co., Union Commerce Bldg., Cleveland 14, O.
Keokuk Electro Metals Co., 429 So. 4th St., Keokuk, Iowa.
Miller & Company, 332 S. Michigan Ave., Chicago 4, Ill.
Pickands, Mather & Co., Cleveland 14, O.
Pittsburgh Coke & Chemical Co., Grant Building, Pittsburgh 19, Pa.
Republic Steel Corp., 3100 E. 45th St., Cleveland 4, Ohio.
Woodward Iron Co., Woodward, Ala.

PIG IRON (Silvery)

Globe Iron Co., Jackson, Ohio.
Keokuk Electro Metals Co., 429 So. 4th St., Keokuk, Iowa.
Miller & Company, 332 S. Michigan Ave., Chicago 4, Ill.

PINS (Flask)—See FLASK BUSHINGS, PINS and FITTINGS

PISTON RINGS (for Molding Machines, Compressors, etc.)

Nicholls, Wm. H. Co., Richmond Hill, Long Island 18, N. Y.

PITCH

M. A. Bell Co., 217 Lombard St., St. Louis 2, Mo.
Whitehead Bros. Co., 324 West 23rd St., New York 11, N. Y.

PLUMBAGO—See GRAPHITE and GRAPHITE BRIQUETS

PNEUMATIC TOOLS and CHISELS

Chambersburg Engineering Co., Chambersburg, Pa.
Chicago Pneumatic Tool Co., 6 East 44th St., New York 17, N. Y.
Cleco Pneumatic Tool Div., Reed Roller Bit Co., Houston, Texas.
Dayton Pneumatic Tool Co., Dayton 1, Ohio.
Gardner-Denver Co., Quincy, Ill.
Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.
Joy Mfg. Co., Henry W. Oliver Bldg., Pittsburgh 22, Pa.
Keller Tool Co., Grand Haven, Michigan.
Master Pneumatic Tool Co., Inc., Orwell, Ohio.
Rotor Tool Co., 26300 Lakeland Blvd., Cleveland 23, Ohio.
Schramm Inc., West Chester, Pa.

POURING DEVICES

Industrial Equipment Co., Minster, Ohio.
Modern Equipment Co., Port Washington, Wis.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

PRESSER BOARDS

Adams Co., Dubuque, Iowa.
Christiansen Corp., 210 South Marion, Oak Park 1, Ill.

PRESSURE RECORDERS

Foxboro Company, Foxboro, Mass.

PULLEYS (Magnetic)—See SEPARATORS (Magnetic)

PULVERIZERS

Metals Disintegrating Co. Inc., Pulverizing Machinery Div., Chatham Rd., Summit, N. J.

PUMPS

Gardner-Denver Co., Quincy, Ill.

PUMPS (Dry, Vacuum)

Allis Chalmers Mfg. Co., Milwaukee 1, Wis.
Fuller Company, Catasauqua, Pa.
Roots-Connersville Blower Div., Connersville, Ind.

PUSH-OFF MACHINES—See PATTERN DRAW MACHINES

PUTTY (Foundry)

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

PYROMETERS

Buehler Ltd., 2120 Greenwood Ave., Evanston, Ill.
Foxboro Company, Foxboro, Mass.
Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.
Claude S. Gordon Co., 3000 So. Wallace, Chicago 16, Ill.
Illinois Testing Laboratories, Inc., 418 N. LaSalle St., Chicago 10, Ill.
Marshall Co., L. H., 270 W. Lane, Columbus 1, O.
Pyrometer Instrument Co., Bergenfield, N. J.

RACKS (Core Ovens)

Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.

RADIOGRAPHY (Industrial)

Eastman Kodak Co., Rochester, N. Y.
Radium Chemical Co., Inc., 161 East 42nd St., New York 17, N. Y.
Technical Operations Inc., 6 Schouler Court, Arlington 74, Mass.
Tracerlab, Inc., 130 High Street, Boston 10, Mass.

RADIUM

Radium Chemical Co., Inc. 161 East 42nd St., New York 17, N. Y.

REFRACTORIES (Firebrick, Fire Clay, Fire Sand, Fire Stone)

Babcock & Wilcox Co., 161 42nd St., New York 17, N. Y.
Botfield Refractories, 786 S. Swanson St., Philadelphia 47, Pa.
Campbell-Hausfeld Co., Harrison, O.
Carborundum Co., Niagara Falls, N. Y.
Carborundum Co., Perth Amboy, N. J.
Carpenter Brothers Inc., 606 West Wisconsin Ave., Milwaukee 3, Wis.
Cedar Heights Clay Co., Oak Hill, Ohio.
Cleveland Quarries Co., Amherst, Ohio.
Durex Refractories Co., P.O. Box 147, Jackson, O.
Eastern Clay Products Dept., International Minerals & Chemical Corp., 20 N. Wacker Dr., Chicago 6, Ill.
General Refractories Co., 1520 Locust St., Philadelphia 2, Pa.
Great Lakes Carbon Corp., Hancock Bldg., Niagara Falls, N. Y.
A. P. Green Fire Brick Co., Mexico, Missouri.
Harbison-Walker Refractories Co., 1745 Farmers Bank Bldg., Pittsburgh 22, Pa.
Illinois Clay Products Co., Joliet, Ill.
Ironton Fire Brick Co., Ironton, O.
Johns-Manville, 22 East 40th St., New York 16, N. Y.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.
Mexico Refractories Co., Mexico, Mo.
Mullite Refractories, Shelton, Conn.
National Carbon Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
National Foundry Sand Co., 2970 W. Grand Blvd., Detroit 2, Mich.
Norton Co., Worcester 6, Mass.
Richard C. Remmey Son Co., Hedley St. & Delaware River, Philadelphia 37, Pa.
Frederic B. Stevens, Inc., 18th St. & Vernor Highway, Detroit 16, Mich.
Stroman Furnace & Engineering Co., Div. of Peterson Oven Co., 9900 Franklin Ave., Franklin Park, Ill.
Titanium Alloy Mfg. Div., National Lead Co., Hyde Park Blvd., Niagara Falls, N. Y.
United States Graphite Co., Saginaw, Mich.
Walsh Refractories, 101 Ferry St., St. Louis 7, Mo.
Whitehead Bros. Co., 324 West 23rd St., New York 11, N. Y.

RESIN (Shell Mold)

Acme Resin Corp., Forest Park, Ill.
Bakelite Corp., 300 Madison Ave., New York 17, N. Y.
The Borden Co., Thor Division, 350 Madison Ave., New York 17, N. Y.
Durez Plastics & Chemicals Inc., North Tonawanda, N. Y.
General Electric Co., Pittsfield, Mass.
Hercules Powder Co., Wilmington 99, Del.
Monsanto Chemical Co., Plastics Div., Springfield 2, Mass.
Reichhold Chemical Co., 525 North Broadway, White Plains, N. Y.
Schenectady Resins, P. O. Box 1046, Schenectady, New York.

RESPIRATORS

Chicago Eye Shield Co., 2300 West Warren, Chicago 12, Ill.
Willson Products Inc., Reading, Pa.

RIDDLES (Electric)

Champion Div. Pettibone Mulliken Corp., 2424 N. Cicero, Chicago 39, Ill.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Foundry Supplies & Mfg. Co., 2221 Orchard St., Chicago 14, Ill.
Great Western Mfg. Co., Leavenworth, Kans.

RIDDLES (Hand)

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Great Western Mfg. Co., Leavenworth, Kansas.
Frederic B. Stevens, Inc., 18th St. & Vernor Highway, Detroit 16, Mich.

RISER COMPOUNDS

Asbury Graphite Mills, Inc., Asbury, N. J.
Foundry Services, Inc., 260 Madison Avenue, New York 16, N. Y.

ROD STRAIGHTENERS—See CORE ROD STRAIGHTENING and CUTTING MACHINERY

ROLLER-HEARTH FURNACES — See FURNACES (Heat Treating and Annealing)

RUBBER LINING MATERIAL (Abrasive Resisting)

Pangborn Corp., Hagerstown, Md.

SAFETY CLOTHING

American Optical Co., Southbridge, Mass.
M. A. Bell Co., 217 Lombard St., St. Louis 2, Mo.
Chicago Eye Shield Co., 2300 West Warren, Chicago 12, Ill.
Pangborn Corp., Hagerstown, Md.
United States Rubber Co., 4300 New Haven Ave., Ft. Wayne 4, Ind.

SAND (Core, Molding, Blasting)

Carpenter Brothers, Inc., 606 West Wisconsin, Milwaukee 3, Wis.
Hardy Sand Co., P. O. Box 476, Evansville, Indiana.
Orefraction Inc., 7425 Thomas St., Pittsburgh 8, Pa.
Ottawa Silica Co., Ottawa, Ill.
Pangborn Corp., Hagerstown, Md.

Pennsylvania Glass Sand Corp., 140 Stanwix St., Pittsburgh 22, Pa.
Standard Silica Corp., 209 So. LaSalle St., Chicago 4, Ill.
Titanium Alloy Mfg. Div., National Lead Co., Hyde Park Blvd., Niagara Falls, N. Y.
Wedron Silica Co., 135 S. LaSalle St., Chicago 3, Ill.
Whitehead Bros. Co., 324 West 23rd St., New York 11, N. Y.

SAND BLAST BARRELS—See BLAST CLEANING EQUIPMENT

SAND BLAST EQUIPMENT—See BLAST CLEANING EQUIPMENT

SAND BLAST NOZZLES—See NOZZLES (Blasting)

SAND BLAST ROOMS—See BLAST CLEANING EQUIPMENT

SAND BLAST TABLES—See BLAST CLEANING EQUIPMENT

SAND CONTROL & TESTING EQUIPMENT

Beardsley & Piper Div. Pettibone Mulliken Corp., 2424 No. Cicero, Chicago 39, Ill.
Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.
Claude S. Gordon Co., 3000 So. Wallace, Chicago 16, Ill.
Great Western Mfg. Co., Leavenworth, Kansas.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.

SAND DRYERS

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Bartlett & Snow Co., C. O., 6201 Harvard Ave., Cleveland 5, Ohio.
Crane Co., 836 South Michigan Ave., Chicago 5, Ill.
Link-Belt Co., 307 North Michigan Ave., Chicago 1, Ill.
Nichols Engineering & Research Corp., 70 Pine St., New York 5, N. Y.

SANDING MACHINERY (Disc, Spindle, Belt, etc.)

Cleco Division of Reed Roller Bit Co., Houston, Texas.
Freeman Supply Co., 1152 E. Broadway, Toledo 5, Ohio.
Oliver Machinery Company, Grand Rapids 2, Mich.

SAND MEASURING and WEIGHING DEVICES

Baker Perkins Inc., Saginaw, Mich.
Link-Belt Co., 307 North Michigan Ave., Chicago 5, Ill.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.

SAND MIXERS—See SAND PREPARATION EQUIPMENT

SAND PREPARATION EQUIPMENT

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
American Air Filter Co., Louisville 8, Ky.
American Wheelabrator & Equipment Co., Mishawaka, Ind.
Baker Perkins Inc., Saginaw, Mich.
Bartlett & Snow Co., C. O., 6201 Harvard Ave., Cleveland 5, O.
Beardsley & Piper Div. Pettibone Mulliken Corp., 2424 N. Cicero, Chicago 39, Ill.
Blystone Division, Standard Sand & Machine Co., 549 W. Washington Blvd., Chicago 6, Ill.
Carrier Conveyor Corp., Frankfort Ave. at Clifton, Louisville 6, Ky.
Champion Div., Pettibone Mulliken Corp., 2424 N. Cicero, Chicago 39, Ill.
Clearfield Machine Co., Clearfield, Pa.

Deister Concentrator Co., 901 Glosgow Ave., Ft. Wayne, Ind.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, Ohio.
Foundry Supplies & Mfg. Co., 2221 Orchard St., Chicago 14, Ill.
Great Western Mfg. Co., Leavenworth, Kansas.
The Hydro-Blast Corp., 2550 N. Western Ave., Chicago 47, Illinois.
Jeffrey Mfg. Co., 907-99 N Fourth St., Columbus 16, O.
Link-Belt Company, 307 North Michigan Ave., Chicago 1, Ill.
Moulders Friend, Dallas City, Ill.
Muller Machinery Co., Metuchen 1, N. J.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Newaygo Engineering Co., Newaygo, Mich.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.
Pangborn Corp., Hagerstown, Md.
The Patterson-Kelley Co. Inc., East Stroudsburg, Pa.
Pekay Machine & Engineering Co., 865 N. Sangamon St., Chicago 22, Ill.
Planet Corp., 1820 Sunset, Lansing 6, Mich.
Posey Iron Works, Inc., Lancaster, Pa.
Royer Foundry & Machine Co., Kingston, Pa.
Simplicity Engineering Co., Durand, Mich.
States Engineering Corp., 922 W. Berry, Ft. Wayne 2, Ind.

SAND RAMMERS

Chicago Pneumatic Tool Co., 6 East 44th St., New York 17, N. Y.
Cleco Pneumatic Tool Div., Reed Roller Bit Co., Houston, Texas.
Dayton Pneumatic Tool Co., Dayton 1, O.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.
Keller Tool Co., Grand Haven, Michigan.
Master Pneumatic Tool Co., Inc., Orwell, Ohio.
Rotor Tool Co., 26300 Lakeland Blvd., Cleveland 23, Ohio.

SAND RECLAIMERS

Hydro Blast Corp., 2550 N. Western, Chicago 47, Ill.
Jeffrey Mfg. Co., 907 N. Fourth St., Columbus 16, O.
Link-Belt Co., 307 North Michigan Ave., Chicago 1, Ill.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Newaygo Engineering Co., Newaygo, Mich.
Nichols Engineering & Research Corp., 70 Pine St., New York 5, N. Y.
Stearns Magnetic Mfg. Co., 635 S. 28th St., Milwaukee 46, Wis.

SAND SIFTING and SCREENING MACHINERY—See SAND PREPARATION EQUIPMENT

SAND STORAGE BINS & GATES

American Bridge Div. United States Steel Corp., 525 Wm. Penn Place, Pittsburgh 19, Pa.
Bartlett & Snow, C. O., Co., 6201 Harvard Ave., Cleveland 5, Ohio.
Beardsley & Piper Div., Pettibone Mulliken Corp., 2424 No. Cicero, Chicago 39, Ill.
Gerotor May Corp., Maryland Avenue & Oliver, Baltimore, Md.
Jeffrey Mfg. Co., Columbus 16, O.
Link-Belt Co., 307 North Michigan Ave., Chicago 1, Ill.
Marietta Concrete Corp., Marietta, Ohio.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Neff & Fry Co., Camden, Ohio.
Newaygo Engineering Co., Newaygo, Mich.
Planet Corp., 1820 Sunset, Lansing 6, Mich.

SAWS (Band, Metal, Wood)

American Saw & Mfg. Co., Springfield, Mass.
W. O. Barnes Co., 1297 Terminal Ave., Detroit 14, Mich.
Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh 8, Pa.
Oliver Machinery Company, Grand Rapids 2, Mich.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

SCALING HAMMERS—See PNEUMATIC TOOLS and CHISELS

SCALES

Toledo Scale Co., Toledo 1, Ohio

SCREENS (Shakeout and Vibrating)

Ajax Flexible Coupling Co., Westfield, N. Y.
Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Bartlett & Snow, C. O., Co., 6201 Harvard Ave., Cleveland 5, Ohio.
Beardsley & Piper Div. Pettibone Mulliken Corp., 2424 N. Cicero, Chicago 39, Ill.
Carrier Conveyor Corp., Frankfort Ave. at Clifton, Louisville 6, Ky.
Great Western Mfg. Co., Leavenworth, Kansas.
Jeffrey Mfg. Co., 907 N. Fourth St., Columbus 16, O.
Link-Belt Co., 307 North Michigan Ave., Chicago 1, Ill.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Robins Conveyors Div., Hewitt-Robins Inc., 270 Passaic Ave., Passaic, N. J.
Simplicity Engineering Co., Durand, Mich.

SEA COAL

M. A. Bell Co., 217 Lombard St., St. Louis 2, Mo.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Frederic B. Stevens, Inc., Detroit 16, Mich.
Whitehead Bros. Co., 324 West 23rd St., New York 11, N. Y.

SEPARATORS (Air, Moisture, Oil)

American Air Filter Co., Louisville 8, Ky.
American Wheelabrator & Equipment Co., Mishawaka, Ind.
Jas. A. Murphy & Co., Hamilton, O.
Pangborn Corp., Hagerstown, Md.
A. Schrader's Son, 470 Vanderbilt Ave., Brooklyn 17, N. Y.

SEPARATORS (Magnetic)

Beardsley & Piper Div., Pettibone Mulliken Corp., 2424 N. Cicero, Chicago 39, Ill.
Dings Magnetic Separator Co., 4740 Electric Ave., Milwaukee 7, Wis.
Homer Mfg. Co., Lima, Ohio.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Stearns Magnetic Mfg. Co., 635 S. 28th St., Milwaukee 46, Wis.

SHAKE-OUT MACHINERY

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
American Air Filter Co., Louisville 8, Ky.
Bartlett & Snow, C. O., Co., 6201 Harvard Ave., Cleveland 5, O.
Beardsley & Piper Div., Pettibone Mulliken Corp., 2424 N. Cicero, Chicago 39, Ill.
The Branford Co., 131 Chestnut St., New Haven 7, Conn.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.
Link-Belt Co., 307 N. Michigan Ave., Chicago 9, Ill.
Planet Corp., 1820 Sunset, Lansing 6, Mich.
Robins Conveyors, Div., Hewitt-Robins Inc., 270 Passaic Ave., Passaic, N. J.
Royer Foundry & Machine Co., Kingston, Pa.
Simplicity Engineering Co., Durand, Mich.

SHELL MOLDING (Equipment & Accessories)

Cambria Foundry & Machine Co., Ebensburg, Pa.
Injection Molders Supply Co., 3514 Lee Rd., Cleveland 20, Ohio.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Shell Process Inc., McKinstry Ave., Chicopee, Mass.
Sutter Products Co., Dearborn, Mich.

SHELL MOLD SAND (Coated)

Acme Resin Corp., Forest Park, Ill.

SHELL MOLDS—See RESIN

SHOCK ABSORBING PADS

Fabreeka Products, Inc., 222 Summer St., Boston 10, Mass.

SHOT AND GRIT

Abrasive Shot and Grit Company, Springville, New York.
Alloy Metal Abrasive Co., 311 W. Huron St., Ann Arbor, Mich.
American Steel Abrasives Co., Galion, O.
American Wheelabrator & Equipment Co., Mishawaka, Ind.
Carborundum Co., Niagara Falls, N. Y.
Carpenter Brothers, Inc., 606 West Wisconsin, Milwaukee 3, Wis.
Cleveland Metal Abrasive Co., 887 E. 67th St., Cleveland, Ohio.
Hickman-Williams & Co., Union Commerce Bldg., Cleveland 14, O.
Metal Blast, Inc., 871 E. 67th St., Cleveland, Ohio.
Metals Disintegrating Co. Inc., Harrison Abrasive Div., Elizabeth, N. J.
National Metal Abrasive Co., 3560 Norton Ave., Cleveland 7, O.
Pangborn Corp., Hagerstown, Md.
Pittsburgh Crushed Steel Co., Pittsburgh 1, Pa.
W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2, Ohio.
Steel Shot & Grit Co., Inc., 39 Warren Ave., Boston, Mass.
Steel Shot Producers, Inc., Butler, Pa.

SHOT (Peening)—See SHOT and GRIT

SHOVELS

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Frederic B. Stevens, Inc., Detroit 16, Mich.

SHOVELS (Power)

Clark Industrial Truck Div., Clark Equipment Co., Battle Creek, Mich.
Frank G. Hough Co., Libertyville, Ill.

SILICA FLOUR

Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, O.
Hardy Sand Co., P. O. Box 476, Evansville, Indiana.
Ottawa Silica Co., Ottawa, Ill.
Pennsylvania Pulverizing Co., 140 Stanwix St., Pittsburgh 22, Pa.
Standard Silica Corp., 209 So. LaSalle St., Chicago 4, Ill.
Wedron Silica Co., 135 S. LaSalle St., Chicago 3, Ill.

SILICOMANGANESE

Electro Metallurgical Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

SILICON (Briquets)

Electro Metallurgical Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
Ohio Ferro-Alloys Corp., Canton 9, Ohio.

SILICON CARBIDE (Briquets)

Carborundum Co., Perth Amboy, N. J.

SILVERY PIG IRON—See PIG IRON (Silvery)

SLAG DISPOSAL UNIT

American Conveyor Co., 1115 West Adams St., Chicago 7, Ill.

SLINGS (Chain)—See CHAIN

SLINGS (Wire Rope)

Union Wire Rope Co., 21st & Manchester Ave., Kansas City, Mo.

SLIP FLASKS—See FLASKS, SLIP

SLIP JACKETS—See MOLD JACKETS

SMELTERS & REFINERS

Christiansen Corp., 210 South Marion, Oak Park 1, Ill.
Federated Metals Div., American Smelting and Refining Co., 120 Broadway, New York 5.
R. Lavin & Sons Inc., 3426 So. Kedzie Ave., Chicago 23, Ill.

SNAGGING MACHINES—See GRINDERS

SNAGGING WHEELS—See GRINDING WHEELS

SNAP FLASKS—See FLASKS (Snap)

SODA ASH

Columbia-Southern Chemical Corp., Div., Pittsburgh Plate Glass Co., Pittsburgh 19, Pa.
Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, Ohio.
Hercules Powder Co., Wilmington 99, Del.
Mathieson Chemical Corp., Mathieson Bldg., Baltimore 3, Md.
Solvay Process Division, Allied Chemical & Dye Corp., 61 Broadway, New York 6, N. Y.

SOLDER

Federated Metals Div., American Smelting and Refining Co., 120 Broadway, New York 5.

SPECTROGRAPHIC ANALYSIS

Baird Associates, 33 University Rd., Cambridge 38, Mass.
Chas. C. Kawin Co., 431 South Dearborn St., Chicago 5, Ill.

SPRAY GUNS

The Branford Co., 131 Chestnut St., New Haven 7, Conn.
Murphy & Co., Jas. A., Hamilton, O.

SPRUE CUTTERS

Adams Co., Dubuque, Iowa.
Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, Ohio.
Freeman Supply Co., 1152 East Broadway, Toledo, Ohio.

Milwaukee Chaplet & Mfg. Co., 1023 S. 40th St., Milwaukee, Wis.
Rice Pump & Machine Co., Belgium, Wis.

STEEL SHOT—See SHOT and GRIT

STEEL (Structural)
American Bridge Co., Div. United States Steel Corp., 52 S. Wm. Penn Place, Pittsburgh 19, Pa.

STRAINER CORES—See CORES (Strainer, Ceramic)

STRIPPING MACHINES—See PATTERN DRAW MACHINES

TANK TRAPS
Jas. A. Murphy & Co., Hamilton, Ohio.

TANKS (Dewatering)
Claude B. Schneible Co., 212 Stephenson Bldg., P. O. Box 81, North End Station, Detroit 2, Mich.

TAPPING MACHINES
Cleveland Tapping Machine Co., Canton 6, Ohio.

TELLURIUM
American Smelting & Refining Co., 120 Broadway, New York 5, N. Y.

TEMPERATURE CONTROLLERS
Foxboro Company, Foxboro, Mass.
Illinois Testing Laboratories, Inc., 418 LaSalle St., Chicago 10, Ill.
Marshall Co., L. H., 270 W. Lane, Columbus 1, O.

TENSILE TESTING MACHINES
Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.
Detroit Testing Machine Co., 19390 Grinnell Ave., Detroit 13, Mich.

TESTING EQUIPMENT—See Type of Test

THERMOCOUPLES
Claude S. Gordon Co., 3000 So. Wallace, Chicago 16, Ill.
Illinois Testing Laboratories, Inc., 418 N. LaSalle St., Chicago 10, Ill.
Marshall Co., L. H., 270 W. Lane, Columbus 1, O.
Pyrometer Instrument Co., Bergenfield, N. J.
Tamms Industries Inc., 228 N. LaSalle St., Chicago 1, Ill.

THREADING MACHINES
Cleveland Tapping Machine Co., Canton 6, Ohio.

TIMERS (Electric)
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.

TIN
Federated Metals Div., American Smelting and Refining Co., 120 Boadway, New York 5, N. Y.

TONGS
Industrial Equipment Co., Minster, O.

TORCHES and BURNERS (Acetylene, Gas, Oil)
Freeman Supply Co., 1152 East Broadway, Toledo, Ohio.
Hauck Mfg. Co., 106 Tenth St., Brooklyn 15, N. Y.
Linde Air Products Co., 30 E. 42nd St., New York 17.

TORCHES (Gouging & Cutting)—See WELDING, CUTTING and GOUGING APPARATUS

TOTE BOXES—See BOXES (Stacking, Tote)

TRACTOR—See TRUCKS (Utility and Power Lift)

TRAMRAIL SYSTEMS—See CONVEYORS (Overhead Monorail)

TROLLEYS
Curtis Pneumatic Machinery Div. Curtis Mfg. Co., 1905 Kienlen Ave., St. Louis 20, Mo.
Link-Belt Company, 307 North Michigan Ave., Chicago 1, Ill.
Modern Equipment Co., Port Washington, Wis.

TRUCK CRANES
Silent Hoist & Crane Co., 885 63rd St., Brooklyn 20, N. Y.

TRUCK WHEELS
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

TRUCKS (Core)
Clark Industrial Truck Div., Clark Equipment Co., Battle Creek, Mich.
Foundry Equipment Co., 1831 Columous Rd., Cleveland 13, Ohio.
Prime Mover Co., Muscatine, Iowa.
Ready Power Co., 3826 Grand River Avenue, Detroit 8, Michigan.
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

TRUCKS (Utility and Power Lift)
Baker-Lull Corp., 314 West 90th St., Minneapolis 20, Minn.
Baker-Raulang Co., 1250 West 80th St., Cleveland 2, Ohio.
Clark Industrial Truck Div., Clark Equipment Co., Battle Creek, Mich.
Frank G. Hough Co., Libertyville, Ill.
Jaeger Machine Co., Columous 16, Ohio.
Kwik-Mix Co., 3026 West Concordia, Milwaukee 16, Wis.
Prime Mover Co., Muscatine, Iowa.
Ready Power Co., 3826 Grand River Avenue, Detroit 8, Michigan.
Silent Hoist & Crane Co., 885 63rd St., Brooklyn 20, N. Y.
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.
Towmotor Corp., 1226 East 152nd St., Cleveland 10, Ohio.
Tractomotive Corp., Deerfield, Ill.

TUMBLING BARRELS
Globe Stamping Co., Div. Hupp Corp., 1250 West 76th St., Cleveland 2, Ohio.
W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2, Ohio.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

TURNTABLES
Beardsley & Piper Div. Pettibone Mulliken Corp., 2424 No. Cicero, Chicago 39, Ill.
Modern Equipment Co., Port Washington, Wis.
Newaygo Engineering Co., Newaygo, Mich.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

UNLOADERS (Car)
Link-Belt Company, 307 North Michigan Ave., Chicago 1, Ill.

UNLOADERS (Portable-Gas, Electric)
Barber-Greene Co., Aurora, Ill.

VALVES (Air, Water, Steam)
Grinnell Co., Inc., Providence, R. I.
Ross Operating Valve Co., 120 East Golden Gate, Detroit, Michigan.

VALVES (Blow-off and Cut-off)
Champion Div. Pettibone Mulliken Corp., 2424 N. Cicero, Chicago 39, Ill.
Wm. H. Nicholls Co., Richmond Mill, Long Island 18, N. Y.
Ross Operating Valve Co., 120 East Golden Gate, Detroit, Michigan.

VALVES (Oxygen, Acetylene)
Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

VENTILATING — See DUST COLLECTING, VENTILATING, EXHAUST, COOLING SYSTEMS

VENTS (Corebox)
Champion Foundry & Machine Co., 1314 W. 21st St., Chicago 8, Ill.
Demmler, Wm. & Bros., Kewanee, Ill.
C. M. Smillie & Co., 1124 Woodward Hgts. Blvd., Ferndale 20, Mich.

VIBRATION REDUCTION PADS
Fabreeka Products, Inc., 222 Summer St., Boston 10, Mass.
New York Belting & Packing Co., 1 Market St., Passaic, N. J.

VIBRATORS
Adams Co., Dubuque, Iowa.
Beardsley & Piper Div. Pettibone Mulliken Corp., 2424 No. Cicero, Chicago 39, Ill.
The Branford Co., 131 Chestnut St., New Haven 7, Conn.
Cleveland Vibrator Co., 2828 Clinton Ave., W., Cleveland 13, Ohio.
Davenport Machine & Foundry Co., Davenport, Iowa.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Foundry Supplies & Mfg. Co., 2221 Orchard St., Chicago 14, Ill.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.
Link-Belt Co., 307 North Michigan Ave., Chicago 1, Ill.
Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee, Wis.
Nicholls Co., Wm. H., Richmond Hill, Long Island 18, N. Y.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, Ohio.
S P O Incorporated, 7500 Grand Division Ave., Cleveland 5, O.
Frederic B. Stevens, Inc., 18 St. & Vernor Highway, Detroit 16, Mich.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

VISES (Hydraulic, Mechanical, etc.)
Desmond-Stephan Mfg. Co., Urbana, Ohio.
Wilton Tool Mfg. Co., 925-941 Wrightwood Ave., Chicago 14, Ill.

WASHES—See CORE and MOLD WASH

WEDGES (Foundry)
The Adams Co., Dubuque, Iowa.
Hardy Sand Co., P. O. Box 476, Evansville, Indiana.
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

WELDING APPARATUS (Electric arc)
Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y.
Harnischfeger Corp., 4400 W. National Ave., Milwaukee 14, Wis.
Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

WELDING, CUTTING and GOUGING APPARATUS and SUPPLIES
Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y.
Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

WELDING ELECTRODES (Carbon)
National Carbon Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
United States Graphite Co., Saginaw, Mich.

WELDING GAS—See GAS

WELDING RODS & ELECTRODES
Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y.
Carborundum Co., Perth Amboy, N. J.
International Nickel Co., Inc., 67 Wall St., New York 5, N. Y.
Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.
Marquette Mfg. Co., 307 East Hennepin Ave., Minneapolis, Minn.

WETTING AGENTS
Aquadyne Corp., 441 Lexington Ave., New York 17, N. Y.

WHEELBARROWS
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

WHEELS (Wire Brush)
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, Ohio.

WIRE BENDERS
Redford Iron & Equipment Co., 20733 Glendale Ave., Detroit 23, Mich.

WIRE CUTTERS
Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, Ohio.
Redford Iron & Equipment Co., 20733 Glendale Ave., Detroit 23, Mich.

WIRE NAILS
Republic Steel Corp., 3100 E. 75th St., Cleveland 4, Ohio.

WOODWORKING MACHINERY
Oliver Machinery Co., Grand Rapids 2, Mich.

X-RAY EQUIPMENT
Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
American Cystoscope Makers Inc., 129 East 78th St., New York, N. Y.

X-RAY FILM and ACCESSORIES
Eastman Kodak Co., Rochester, N. Y.

ZINC
Federated Metals Div., American Smelting and Refining Co., 120 Broadway, New York 5, N. Y.

ZINC BASE DIE CASTING ALLOYS
R. Lavin & Sons Inc., 3426 So. Kedzie Ave., Chicago 23, Ill.

ZIRCON SAND
Orefraction Inc., 7425 Thomas St., Pittsburgh 8, Pa.

CLASSIFIED ADVERTISING

Help Wanted

PLANT ENGINEER

MUST HAVE EXPERIENCE IN STEEL FOUNDRY TO TAKE CHARGE OF BOTH CONSTRUCTION AND ALL MAINTENANCE. IN REPLYING GIVE COMPLETE INFORMATION WHICH WILL BE HELD IN STRICT CONFIDENCE BY A SINGLE EXECUTIVE.

BOX 293

FOUNDRY **CLEVELAND 13, OHIO**

SALES ENGINEER AND MACHINE DESIGNER

BOTH TO BE FAMILIAR WITH MOLDING MACHINE APPLICATION

A midwest manufacturer has an excellent opportunity for two men with the right qualifications. Give complete abstract of education and experience and state salary desired.

BOX 255

FOUNDRY **CLEVELAND 13, OHIO**

GENERAL FOREMAN

For medium-heavy gray iron jobbing foundry, pouring up to 20 tons daily, located in the Middle West. Must be experienced in sand slinger operation and be responsible for making all kinds of jobbing castings. C.I.O. shop. State experience and salary desired.

BOX 315

FOUNDRY **CLEVELAND 13, OHIO**

WANTED

Foundry Foreman for Night Shift. Must have experience in all operations of a production nonferrous foundry specializing in bronze, located in Eastern Massachusetts.

In reply state full particulars regarding experience, education and salary expected.

BOX 317

FOUNDRY **CLEVELAND 13, OHIO**

INDUSTRIAL ENGINEER

Position open with midwest gray iron and alloy iron jobbing foundry to assume charge of time study, incentives, and methods engineering. Prefer man with pattern shop experience. If interested state age, detail of experience, and salary desired. Address: Box 273, FOUNDRY, Cleveland 13, Ohio.

MOLDING FOREMAN

A reputable midwest foundry producing high alloy castings has immediate need for a high caliber supervisor. Extensive experience in the molding of high alloy is a prime requisite. Must be meticulous in the supervision of producing extremely high quality molds. Address: Box 316, FOUNDRY, Cleveland 13, Ohio.

METALLURGIST

With foundry experience in production of top quality alloy steels to aircraft specifications. Position with East Coast plant of a nationally known investment casting manufacturer. Address replies submitting full resume to: **BOX F 1081, 221 West 41st ST., NEW YORK 36.**

Help Wanted

WANTED

MECHANICAL ENGINEERS

Experienced in the design of pattern equipment, core boxes, qualifying fixtures and special machines.

Excellent Salary
Permanent Position
Good Working Conditions
and
Unlimited Opportunities
With a Fast-Growing Organization

BOX 324

FOUNDRY **CLEVELAND 13, OHIO**

METALLURGIST

B.S. degree from recognized engineering school. At least three years' experience in light alloy foundry, familiar with sands, melting procedures, gating, rigging and Heat Treatment. Must have ability to head staff of foundry metallurgists and technicians.

BOX 334

FOUNDRY **CLEVELAND 13, OHIO**

HELP WANTED

STEEL FOUNDRYMAN AS CONTROL SUPERVISOR. EXPERIENCED IN RIGGING, CHILLING AND MOLDING OF STEEL CASTINGS. ¼ LB. TO 2000 LB., BY ELECTRIC PROCESS. WIDE EXPERIENCE REQUIRED.
WILL ARRANGE INTERVIEW WITH QUALIFIED APPLICANTS.
LOCATION: CENTRAL OHIO.

BOX 323

FOUNDRY **CLEVELAND 13, OHIO**

MOLD DESIGNER—DRAFTSMAN

Will train for designing permanent molds in Southeastern Pennsylvania nonferrous foundry. Opportunity for responsible man. Send complete resume with salary requirement.

BOX 322

FOUNDRY **CLEVELAND 13, OHIO**

PRODUCTION MANAGER

Modern, medium-sized steel jobbing foundry requires experienced Production Manager to take charge of production department. Must be experienced in production scheduling, follow-up and customer relations. The right man can look forward to a permanent career with a progressive, expanding organization in the Metropolitan New York Area. Address: Box 284, FOUNDRY, Cleveland 13, Ohio.

PATTERN SHOP SUPERVISOR

Opportunity in Pacific Northwest for aggressive, experienced patternmaker. Shop employs 8 to 10. Production and loose patterns manufactured. Operated by steel and gray iron foundry. Please provide work history and pay expected in first letter. Address: Box 321, FOUNDRY, Cleveland 13, Ohio.

Help Wanted

CLEANING ROOM SUPERINTENDENT

Midwestern well established steel foundry needs superintendent to take charge of 40 man crew cleaning operation. Address: Box 333, FOUNDRY, Cleveland 13, Ohio.

WANTED

Experienced cleaning room foreman. Production gray iron foundry making small castings. Address: Box 320, FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

MANAGER OR SUPERINTENDENT

Thirty-five years' practical experience in foundry, molder eighteen years. Have been foreman, superintendent and general manager. Did consultation work in various foundries. One was losing $7,000 per month when I started, in seven months it was making good money. Ran three largest foundries in St. Louis, largest one in Chicago. Understand gray iron, semi-steel, brass, aluminum. Know how to rig jobs to get best production at lowest cost. Understand running of cupola mix of various metals; estimating jobs from blueprints. Can give best of references. Available immediately. Address: Box 269, FOUNDRY, Cleveland 13, Ohio.

MANAGER OR SUPERINTENDENT

Experienced in all phases of foundry operation, jobbing or high production gray, semi-steel and alloyed irons, producing quality castings weighing ounces to tons. Can handle men. Presently employed, available on short notice. Age 43. Address: Box 332, FOUNDRY, Cleveland 13, Ohio.

STEEL FOUNDRYMAN

Supervisory capacity with twenty years' experience in all phases steel foundry. Producing steel castings ranging from one pound to three tons. Good knowledge of foundry equipment, foundry methods and mechanized production. Familiar with heading and gating and rigging of patterns for machine production. Also sand control. Married. Age 47. Address: Box 268, FOUNDRY, Cleveland 13, Ohio.

GENERAL MANAGER

Mature, profit-minded, aggressive. Successfully managed five companies—three taken out of the red. Trained two successors, both made good. Qualified to carry complete administrative responsibility and develop all profitable possibilities. Excellent experience foundry, machinery and related lines. Address: Box 297, FOUNDRY, Cleveland 13, Ohio.

CASTING ENGINEER CUSTOMER CONTACT

M.E. with 20 years ferrous experience covering design, pattern, foundry, machining, inspection and customer contact, desires permanent connection with progressive concern. Address: Box 290, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY ENGINEER

"Do you wish to lower your foundry costs? From an executive observation?" If so allow me to analyze your over-all manufacturing set-up. Address: Box 263, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Thorough knowledge of all phases of nonferrous metals. Understand gating, jobbing, floor, machine and plumbers supplies. Can also produce pressure tight and porous free castings. Know sand control and core room work. Address: Box 341, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY ENGINEER

Young, experienced, foundry engineer under 40 wishes to combine talents with a partner to form management team. Objective to operate or own small or medium-sized foundry. Address: Box 335, FOUNDRY, Cleveland 13, Ohio

Positions Wanted

METALLURGIST OR FOUNDRY ENGINEER

Young, ambitious engineering graduate with good knowledge of ferrous metallurgy, seeking position as metallurgist or foundry engineer. Six successful years metallurgical, supervisory, and engineering experience. Presently employed. Address: Box 314, FOUNDRY, Cleveland 13, Ohio.

FOREMAN

For pressure cast plaster plant situated in Midwest. Must have experience. Excellent opportunity for right man. Give full details. Address: Box 311, FOUNDRY, Cleveland 13, Ohio.

SUPERINTENDENT OR GENERAL FOREMAN

Practical foundryman, twenty-eight years' experience in gray iron and nonferrous, jobbing and production shops. Fifteen years on supervision, well versed in all departments. Available immediately. Good references. Address: Box 338, FOUNDRY, Cleveland 13, Ohio.

EXECUTIVE

Experienced in all phases of foundry operation and management with thorough knowledge of each shop process, engineering, metallurgy, cost estimating and accounting, sales and industrial relations. Technical graduate. Excellent recommendations. Address: Box 239, FOUNDRY, Cleveland 13, Ohio.

SUPERINTENDENT OF MAINTENANCE

Thirty-eight years old, technical schooling. Desire position with mechanized foundry. Experienced in preventive maintenance having reduced costs and increased production. Good labor relations. Twelve years' supervisory experience. Address: Box 330, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Or general foreman. Fifteen years' experience in high production in steel foundry. Western New York preferred. Other locales considered. Address: Box 329, FOUNDRY, Cleveland 13, Ohio.

SUPERINTENDENT

Twenty-two years' practical foundry experience. Gray iron, brass and aluminum. Economy, quality-minded, above all profit-minded. Address: Box 319, FOUNDRY, Cleveland 13, Ohio.

SUPERVISOR

Sand and quality control, gray or malleable iron. Age 46. Salary $5500. Address: Box 344, FOUNDRY, Cleveland 13, Ohio.

WEST COAST POSITION

Is desired by a hardworking and progressive foreman with an inventive and trouble shooting mind. Journeyman. Graduate mechanical engineer. Seven years' experience in gray iron (jobbing and production) foundries and some steel and nonferrous. Married. Age 31. Address: Box 328, FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Experienced in the management of an iron or steel foundry. Familiar with all phases of foundry production, including labor relations, cost and quality control. Age 37, presently employed. Prefer midwest area. Address: Box 313, FOUNDRY, Cleveland 13, Ohio.

FOUNDRYMAN

Foundry Executives Attention: Lighten your burden, young foundryman, 35 years, with technical and supervisory experience interested in assuming responsibility in foundry management. Address: Box 340, FOUNDRY, Cleveland 13, Ohio.

WORKING FOREMAN

Thirty years' experience, jobbing work, iron, brass, aluminum. All phases foundry work. Prefer small shop, West Coast, age 45. Address: Box 312, FOUNDRY, Cleveland 13, Ohio.

Engineering Service

FOUNDRY TECHNICAL SERVICE FOR STEEL, MALLEABLE, AND GRAY IRON FOUNDRIES

Expert assistance is offered to reduce scrap and costs; to establish sound, stable foundry practices, thus improving service to customers.

INQUIRIES ARE SOLICITED.

HERBERT F. MILLER, CONSULTANT
FOUNDRY ENGINEERING SERVICE
589 TRADE WINDS DRIVE
DUNEDIN, FLORIDA

Wanted-To-Buy

CASH BUYERS

BRASS FOUNDRY BY-PRODUCTS

Brass skimmings, Grindings, Slag, Dust Collector Residue, Polishing dust, Rumbler mud etc.

WE RECLAIM FOUNDRY DUMPS

We furnish labor, equipment and knowhow to recover metal values. WRITE US.

It will pay you to discuss your by-product disposition with us. NO OBLIGATION.

KAUFFMAN-ROBBINS COMPANY

332 SOUTH MICHIGAN AVENUE CHICAGO 4, ILL.

URGENTLY NEEDED FOR EXPORT!

Pittsburgh-Moore Electromelt Furnaces, one-half, one, two and three ton capacity, top charge, or will consider side charge. Send all pertinent data and price.
Also need Handy-Sandy, twin hopper type, Model HS-7-GT will consider other sizes.

BOX 337

FOUNDRY CLEVELAND 13, OHIO

WANTED TO BUY

1—Used B & P Speedmullor, model 30 or 40, with skip hoist. State serial numbers of mullor and motors, condition, and lowest cash price.

BOX 318

FOUNDRY CLEVELAND 13, OHIO

WANTED

one 6-ton geared Tea Pot Ladle.

CRUCIBLE STEEL CASTING COMPANY
2850 S. 20th STREET
MILWAUKEE 15, WISCONSIN

MIXERS WANTED

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price or immediate acceptance. Address Box 578, FOUNDRY, Cleveland 13, Ohio.

MACHINERY WANTED

Induction Furnaces, Screens, Simpson Mixers, Riehle Compression Testing Machines, Pulverizers, Grinders, Conveyors. Address: CONDENSER SERVICE & ENGINEERING CO., INC., HOBOKEN, NEW JERSEY, BA 7-0600.

Representatives Available

FOUNDRY SUPPLIES

Foundryman, experienced, wants to represent competitive foundry supply firm in Western New York. Storage space with railroad available. Address: Box 343, FOUNDRY, Cleveland 13, Ohio.

SALES REPRESENTATION

Established sales organization calling on the automobile industry desires to add a line of gray iron castings to their Detroit and Michigan area.

BOX 331

FOUNDRY CLEVELAND 13, OHIO

REPRESENTATIVE AVAILABLE

Wanted by experienced salesman, competitive gray iron, nonferrous, malleable and steel foundry to represent for Western New York on a commission basis, etc. Address: Box 345, FOUNDRY, Cleveland 13, Ohio.

Representatives Wanted

SALES REPRESENTATIVES

To handle accounts for gray and malleable iron castings on a commission basis. Open territories available in Ohio and Indiana and the Southern area. Write complete personal and sales data in confidence.

BOX 346

FOUNDRY CLEVELAND 13, OHIO

MANUFACTURERS' REPRESENTATIVES

MANUFACTURER OF MOLDING MACHINERY DESIRES REPRESENTATION IN PRINCIPAL FOUNDRY AREAS—ATTRACTIVE PROPOSITION.

BOX 339

FOUNDRY CLEVELAND 13, OHIO

REPRESENTATIVE WANTED

Competitive old established gray iron foundry in Western New York wants a representative on a commission basis. Address: Box 342, FOUNDRY, Cleveland 13, Ohio.

Foundry Work Wanted

FOUNDRY WORK WANTED

We are now open for outside work. We specialize in aluminum "pressure tight" castings, machine castings, and face work. Address: VICKSBURG FOUNDRY, 124 NORTH ST., VICKSBURG, MICHIGAN.

Capacity Wanted

CAPACITY WANTED

Have patented soil pipe which can be installed 3 times faster. Want capacity on possible 3 shift basis. Would like to hear from foundry owners with brains and ability.

ROY BATCHLER
UNIVERSITY BUILDING
DENVER, COLORADO
PH. AL 5-2807—GL 5-6171

Foundries For Sale

GRAY IRON FOUNDRY FOR SALE

Building two years old. Well equipped jobbing shop. Room for 14 molders—10 working now. Producing approximately 7 tons daily. Good labor relations.

BOX 309

FOUNDRY CLEVELAND 13, OHIO

FOR SALE OR LEASE

Well equipped brass and aluminum foundry in central Indiana. Now operating. Address: Box 327, FOUNDRY, Cleveland 13, Ohio.

Employment Service

FOUNDRY PERSONNEL SPECIALISTS
National Placement and Procurement of

GENERAL AND PLANT MANAGERS, PLANT SUPERINTENDENTS, FOREMEN—ALL DEPARTMENTS, METALLURGISTS, ENGINEERS, CONTROLLERS, ACCOUNTANTS, SALESMEN, SALES MANAGERS, PERSONNEL DIRECTORS, PURCHASING AGENTS.

Confidential Inquiries Invited
From Employers and Qualified Applicants.

For Fast Competent Assistance Contact

JOHN COPE, DIRECTOR
IMPERIAL PERSONNEL
37 S. WABASH, CHICAGO 3, ILL.
FRANKLIN 2-4233

Foundries For Sale

17,000 SQ. FT. FOUNDRY

FOR SALE OR LEASE

Gray Iron—Aluminum—Bronze

- 80′ x 210′ BUILDING
- ON 5 ACRES
- RAILROAD SPUR
- 6-TON CAP. CUPOLA
- 200 TONS PER MONTH

PRESENT OWNER WILL TAKE 25% TO 50% OF PRODUCTION

Present owner selling in order to concentrate on manufacturing. Ample business available to take up remaining 50% to 75% of production.

CONTACT: FRANK WHEATLEY, JR.

FRANK WHEATLEY PUMP AND VALVE MFR.

HALE STATION, SAND SPRINGS ROAD

TULSA, OKLAHOMA

GOING CONCERN

Equipped gray iron foundry, very fine customer list, good capacity, good labor available. Owner Company in Dissolution.

BAY TRUST COMPANY, RECEIVER

PHONE 3-7531

BAY CITY, MICHIGAN

FOUNDRY AND MACHINE SHOP FOR SALE

Largest of its kind in this Florida area. Doing business all over the state, annual net averages $24,000 yearly since establishment in 1948. It has excellent and large accounts. Example: Manhole covers, culverts and valve casting work. A 1-story 118 x 38′ concrete block building houses a well equipped shop. $42,000 includes building and all inventory. Address: **E. BOND & CO., INC., 333 N. MICHIGAN, CHICAGO, ILL. ASK FOR K-3185.**

PRODUCTION FOUNDRY

Small nonferrous foundry in Northwestern Ohio, overhead sand system. Easily accessible to Toledo, Chicago, Detroit. 7,000 square feet, masonry building. Plenty of room for expansion. No labor problem. Address: Box 336, FOUNDRY, Cleveland 13, Ohio.

FOR SALE

Brick and steel foundry, Southern Illinois, 160 x 320 feet, overhead monorail, water transportation available. Ideal for mechanized operation, contains equipment. Address: Box 326, FOUNDRY, Cleveland 13, Ohio.

For Sale

FOR SALE

BLOWERS
(2) WHITING Core Blowers (Allis Chalmers) 1.25 pressure, Volume 9800 CFM, 20″ ID intake, BB, DMD
DUST COLLECTORS
(2) ROTOCLONE Type "D", Size 14″, Hopper Type B
ROTOCLONE Hydro-static Precipitator, Type N, Class 500
ROTOCLONE Hydro-static Precipitator, Size 2½, Type N, Class 500
CRANES
BAY CITY Crawler, 7½ ton capacity, 30′ boom, Gasoline Engine
FORDSON Tractor, 2000# capacity, 6′ Boom, Gasoline Engine
LINK BELT MS90, Rubber Mounted, 20 Ton, 60′ Boom, Gasoline Engine
NORTHWEST, Model 104, 10 Ton Capacity, 45′ Boom
SAND EQUIPMENT
SIMPSON No. 2 Muller
(2) CHAMPION Sand Riddle, Portable, 18″ Basket, Size R
SIMPSON No. 3, Style E, Model H, Mixer
MOLDERS
TABOR, Bench Type, Cap. 18″ x 26″
MILWAUKEE, Jolt Squeeze, Mod. 126-3, Flask Cap. 21″ x 27″
MILWAUKEE, Jolt Squeeze, Mod. 125-3, Cap. 21″ x 27″
MILWAUKEE, Jolt Squeeze Stripper, Mod. 126-3, Cap. 36″ x 36″
COMPRESSORS
SULLIVAN, 125# Pressure, 322 CFM, 60 HP
INGERSOLL-RAND Two Stage, 445 CFM, 75 HP
SPRUE CUTTERS
FERRACUTE, ¾″ Capacity, 5 HP Master
JEFFERY Portable Sand Cutter or Royer, Type P, Class 1, Form A, 18″ x 24″ Screen Opening
JOLT ROLL OVER
(2) HERMAN 40″ x 58″, 3000# Capacity, 18″ Cylinder
JOHNSTON-JENNINGS, Model 918, Pattern Draw 18″ Cope 300#

JOSEPH BEHR & SONS, INC.
1156 SEMINARY STREET
ROCKFORD, ILL. PHONE 27-721

FOR SALE

American Wheelabrator Table #3, complete with dust collector	$4250.00
American Wheelabrator Tumblast, 36″ x 42″ complete with dust collector	$3250.00
Wheelabrator Cabinet with 5 wheels designed for cylinder heads	$5000.00
25 Osborn Molding Machines, jolt roll-over, table 18″ x 24″, draw 8½, No. 2047-4	$ 350.00
22—SPO 110J squeeze jolt rollover	$ 225.00
24—Tabor Molding Machines, 10″ squeeze	$ 115.00
Jeffrey Sanditioner No. 1, capacity 10-15 tons per hour	$ 350.00
Royer Sanditioner, portable junior type	$ 150.00
Sand Riddles, Federal	$ 75.00
Wheelabrator, skip hoist	$ 225.00
American Dustube No. 185, capacity 16920 C.F.M. of cloth area	$ 950.00
American Dustube No. 65, 5640 C.F.M. of cloth area	$ 750.00
American Dustube No. 35A, 1085 C.F.M.	$ 375.00
Pangborn Dust Collectors 1650 C.F.M. of cloth area	$ 500.00
American Rotoclone, Type N, wet type, 2500 C.F.M.	$ 650.00

M. ELSTEIN
370 E. HOUSTON STREET
NEW YORK 2, NEW YORK
CANAL 8-4517

CLASSIFIED ADVERTISING

Foundries For Sale

FOR SALE

MOLDING MACHINES

1—Herman, Jolt, Rollover Draw, 6000#, 40″ x 60″ table.
1—Herman, Jolt Stripper, 48″ x 54″ table.
2—International, Jolt, Rollover Draw, 24″ x 10G, Stationary.
2—International, Jolt, Rollover Draw, 20″ x 8-G, Portable.
1—Plain jolt machine, 60″ x 72″ table, 16″ cylinder.
1—#276 PJ Osborn jolt squeezer.
2—No. 275 Osborn jolt squeezers.
2—SPO #611B Stationary Oscillating Jolt Squeeze Strippers.
1—#610 Johnston & Jennings Air Jolt Rollover Draw Portable 24 x 30 table.
1—Tabor 36 x 50 table Air Jolt Rollover Draw, 3000# capacity.

BLOWERS FOR CUPOLAS AND FURNACES

2—15 HP Spencer-Turbine 2250 CFM at 16 oz.
2—#7½ Roots rotary blowers—27 x 81—14000 CFM.
1—Connersville rotary blower 22 x 66 45 cu. ft. per revolution 9000 CFM.
Maxon-Premix Blowers for Gas ¼ to 1 HP.
2—5 HP 20-oz. Spencer Turbine Blowers.
2—2 HP 20-oz. Spencer Turbine Blowers.

METAL MELTING EQUIPMENT

1—1000# open flame brass melting furnace, gas fired.
1—MNP Fisher Tilting Al. Furnace 600# cap gas fired.
1—550# Reda Furnace, nonferrous or iron—oil or gas.
1—Hausfeld Stationary Brass, oil or gas burner, 200# cap.
1—Hausfeld Tilting crucible, gas, 250# Al. Cap
1—Hausfeld 2000# aluminum capacity furnace, barrel type, open flame, oil fired.
New 32″ to 41″ dia. shell cupolas made to order.
New 1000 lb. aluminum cap. tilting crucible furnaces to specifications.

MISCELLANEOUS

1—Pangborn Rotoblast, 14′ dia. table with five 5′ tables complete.
1—Pangborn 1 to 4 nozzle air blast generator, complete.
1—American Dust Tube Collector, 30 HP blower, 12000 CFM.
1—Sullivan, 2 stage compressor, 14-8¾ x 10, 75 HP.
500 ft. of 10″ Roller Conveyor. Rolls 2½″ centers 4″.
1—Ruemelin cabinet style sand blast room, 7′ x 7′ x 5′ with pres. generator.
1—15 HP Gardner Denver air cooled compressor unit.
1—Stoney crane type shakeout.
1—NC-4 Royer sand separator.
1—#1 Demmler core blower.
1—#16 Roto-clone unit complete.
1—McLeod Small Sand Blast Barrel 24 x 24.
1—30 x 48 tumbling mill.
1—36 x 48 tumbling mill.
Complete stock of rebuilt mill and dust exhaust blowers.

CLIFTON MACHINERY COMPANY

1023 W. SIXTH ST. CINCINNATI 3, OHIO

FOR SALE

One Sandslinger Beardsley & Piper 19″ stationary with plate feeder and bin. One portable sand conditioner Beardsley & Piper 40 tons per hour. One lip pour ladle 8½ ton capacity. All in perfect condition.

BOX 325

FOUNDRY CLEVELAND 13, OHIO

For Sale

FOR SALE

1—American Slag Conveyor System ½ H.P.—220/440-60-3 Like New.
1—Simplicity "KA"—18" x 78" Shaker feeder. 1 H.P.—220/440-60-3, Vari Speed drive—Like New.
1—Penn Bucket 20 cu. ft.—Like New.
1—Blystone 2A (3 cu. ft.) mixer 1 H.P. 220-60-3.
1—American Continuous Wheelabrator—15" with spare parts 220-60-3—Exc. Cond.
1—12" x 132" Flat apron conveyor 220/60/3.
1—Whiting 2500# Mixing ladle—geared—28" x 60".
1—Modern 2500# Mixing ladle—geared—29" x 54".
1—Nichols #11-32 Jolt-squeeze-strip Molding Machine.
1—Nichols #12 Heavy duty Jolt-squeeze-strip Molding Machine.
1—International Roll-Over Type G—24" x 10".
1—Model M Screenarator.
1—Osborn Plain Jolt #100.
1—Conveyor—2 sections Flat apron. 24" x 204" (both sections) with vari-drive 220-60-3.

WRITE OR CONTACT:
J. T. MOORE
WELLS MFG. CO.
7800 N. AUSTIN AVENUE
SKOKIE, ILLINOIS

HAVE YOU EVER NOTICED the numerous types of headings under which classified ads are listed? Whether interested in obtaining qualified personnel, selling used machinery, wanting to buy equipment, or are yourself looking for a better position, you should seriously consider advertising in the classified section of FOUNDRY MAGAZINE.

•

FOUNDRY has 45,000 readers which cover the entire foundry industry. That means that for a nominal sum you get the widest possible coverage of the industry and your advertisement reaches "just the right people".

•

The Classified Staff is equipped to handle all details in the placement of your ad.

Classified
ADVERTISING DEPT.
FOUNDRY
CLEVELAND 13, OHIO

For Sale

BUY—TRADE—SELL
SPECIAL

48 x 42 WHEELABRATOR TUMBLAST $2,500.00

SMALL DOWN PAYMENT 2 YEARS TO PAY

27 x 36 Wheelabrator Tumblast	$2,700.00
#2 Wheelabrator Multi Table 8' Diameter	$3,500.00
Pangborn 6' Air Table	$ 650.00
8' Pangborn Roto-Table	$2,500.00
Pangborn 1 cubic ft Air Barrel	$ 300.00
Pangborn Vapor Blast, Good condition.	$ 750.00

Also

Roto-Clone Dust collectors various sizes, Pressure tanks, Hand cabinets, Blowers, Motors. etc. All types & sizes.
If interested in trading any of the above for your present equipment, Please call or write

DIAMOND SAND BLAST, INC.
5654 WEST JEFFERSON
DETROIT, MICHIGAN
PHONE VINEWOOD 3-6750

FOR SALE

Dresibach Metal Reclaiming Mill—size 5-45. Complete with two sludge ejector tanks, ejector and all necessary motors and controls. Handles brass slag and skimmings up to 3½" diameter at rate of 1500# per hour. Mill was manufactured October 1950 and has seen about seven months service.

NORTH AMERICAN SMELTING COMPANY
P.O. BOX 1952
WILMINGTON, DELAWARE

CARBON & GRAPHITE
Blocks—Plates—Rounds
MOTOR AND GENERATOR BRUSHES
of all types. Original equpment and replacement. Quick delivery from stock. Substantial savings.

BECKER BROS. CARBON CO.
BASIC MANUFACTURERS SINCE 1890.
3448 S. LARAMIE CICERO 50, ILLINOIS
Bishop 2-1260

FOR SALE
TURBO BLOWERS WITH MOTORS

CFM	PRESS.	MAKE	CFM	PRESS.	MAKE
3500	40 oz.	Spencer	400	16 oz.	Spencer
2800	1 oz.	Spencer	400	4.3 oz.	Spencer
2400	16 oz.	Spencer	340	20 oz.	A-B
2500	7 oz.	Sturt.	320	12 oz.	Spencer
2000	2½ oz.	Spencer	225	16 oz.	Spencer
2000	1 oz.	Spencer	180	15 oz.	Spencer
1300	16 oz.	Spencer	110	16 oz.	Spencer
1150	20 oz.	No.Am.	9000	6" SP	Northern
675	16 oz.	No.Am.	2500	½" SP	American
660	20 oz.	A-B	2344	2" SP	Clarage
500	10 oz.	No.Am.	1100	4½" SP	Bayley

THE MOTOR REPAIR & MFG. CO.
1552 HAMILTON AVE.
CLEVELAND 14, OHIO

FOR SALE

1—Beardsley & Piper Motive Jr. Sandslinger. Serial #MJ-255-513. New in 1951. Used only 6 months, and is like new. Will sell for $14,500.00 — f.o.b. Alpena, Michigan. Address: **THUNDER BAY MFG. CORPORATION, ALPENA, MICHIGAN, OR PHONE ALPENA 834.**

SMALL GRAY IRON CASTINGS FOR SALE

Castings up to 300 lbs. Write or Phone: OREGON CASTINGS COMPANY, LITITZ, PENNSYLVANIA, PHONE: 6-2462.

INDUCTION MELTING INSTALLATION

Immediate delivery on a never used 50 kw, 3000 cycle, high frequency motor-generator induction melting installation. Complete with controls and a ferrous or nonferrous furnace. Can be inspected in operation. Address: INDUCTOTHERM CORP., GLENOLDEN, PENNSYLVANIA.

For Sale

SAVE $5,000

#918 Johnston & Jennings Jolt-Clamp-Leveler, Rollover Pattern Draw, 44" x 54" table, 18" draw, Automatic Take-off, Excellent Condition, No Pit Required—Price $2250.00.
#605 Osborn Jolt, Rollover Pattern Draw, 54" x 24" table, 12" Flask size—10" draw, Portable, Like New $750.00.
Dielectric Core Ovens—Model 900A and Model 1800A; Conveyor Type—1949, Will set up in your shop.
Osborn Core Blowers—Models 91, 94, and 193
Herman Jar Rollover & Pattern Draw; 1944; 48" x 144"; 10,000# Series.
Int'l. JDP Pattern Draw; 600 lb. 8" Draw.
#2047 Osborn Jolt Rollovers.
#918 Johnston & Jennings Molding Machine.
#275J Osborn Jolt Squeezers—$125.00 each.
8' Pangborn Tableblast.
36" x 42" Wheelabrator.

BALCHER MACHINERY COMPANY
6020 EUCLID AVENUE
CLEVELAND 3, OHIO
EXPRESS 1-8930

FOR SALE

NEVER USED: for Detroit Electric Furnace Model LFY
1—Kuhlman transformer, 250 KVA, 4160 volt
2—cylindrical shells, Model LFY
1—complete lining for LFY shell

also

1—1000 lb Modern covered ladle

EASTERN FOUNDRY SUPPLIES, INC.
109 FRELINGHUYSEN AVE.
NEWARK 5, N. J.

FOR SALE

1—Tinius Olsen 100,000# Universal Compression Testing Machine
1—Magnaflux Demagnetizing Unit
Simpson Sand Mixers 18" dia. Laboratory #0, #1, #1½, #2, #3
Miscellaneous: Screens, Pulverizers, Grinders, Conveyors—all types, Tyler Rotap Screens, etc.

OUR 37TH YEAR

CONSOLIDATED PRODUCTS CO., INC.
66 BLOOMFIELD STREET
HOBOKEN, NEW JERSEY
HO 3-4425 N.Y. TEL. BA 7-0600

SAVE 40% ON YOUR WORK GLOVE BUDGET FOR SALE

Work gloves, scientifically treated like new, side split cowhide leather, 4" gauntlet, all leather forefinger, knuckle back, tipped fingers, pull tab, lined leather palm, suitable for heavy duty foundry work, $6.50 per dozen pairs. Terms 2% 10 days, net 30, f.o.b., New York City.

FINECRAFT PRODUCTS CO.
175 FIFTH AVENUE NEW YORK 10, N. Y.

FOR SALE
DETROIT ELECTRIC FURNACE

Type AA of 1,200 lb cold metal or 2,600 lb hot metal capacity, complete with mechanical and electrical equipment for melting and rocking, including oil filled transformer of 11,000 v. primary and 125 v. secondary. Presently crated but available for inspection on 48 hours notice. Ideal for high test cast irons, brasses or bronzes. Price: $9,500.00. Address: HOPE ELECTRICAL PRODUCTS CO., 338 WILSON AVENUE, NEWARK 5, N. J.

HEAT TREAT FURNACE

Lindberg Engineering type EH 4860 recirculating pit type furnace. 48 inches in diameter and 60 inches deep for operation at 1250 degrees fahrenheit maximum. Heating circuit 100 KW, 440 V three phases. Control circuit 110 volt single phase. Control instruments are a Wheelco Capacitrol, Wheelco Limitrol and Wheelco Inputrol. Address: ENTERPRISE BRASS WORKS, MUSKEGON, MICHIGAN.

FURNACES FOR SALE

Ten used heat treating furnaces and two 7-ton gantry cranes. Good condition, priced to sell. Address: BAER STEEL PRODUCTS, INC., BOX 1428, BOISE, IDAHO.

UNIVERSAL
MACHINERY AND EQUIPMENT CO.
320 E. BROAD ST.
SHILLINGTON, READING, PENNSYLVANIA
PHONE: READING 7-1321

WE HAVE ACQUIRED THE CONTENTS OF TWO LARGE FOUNDRIES. THIS EQUIPMENT IS ALL LATE TYPE AND IN EXCELLENT CONDITION.

ONE COMPLETE NON FERROUS FOUNDRY WITH 1—12 Station Overhead Sand System.

MIXERS

1—#0 SIMPSON.
1—#1 SIMPSON w/Inc. Gear.
2—#3 SIMPSON w/Skip Hoist.
1—#404 CLEARFIELD. New.
1—#610 CLEARFIELD.
1—3' LANCASTER w/Skip Hoist.
1—#60 B & P SPEEDMULLER with Skip Hoist.
1—LINK BELT Size 5 REVIVIFIER.

CORE OVENS

1—COLEMAN Hinge Door, Oil Fired, 2 Compartment. (Recir.)
1—4 Drawer Compartment, Oil fired. (Recir.)
1—YOUNG BROS. 3 Compartment Elec. Preheat Oven. (Recir.)
2—2 Compartment J. O. ROSS Gas fired Rack type. (Recir.)
1—FOUNDRY EQUIPMENT Rack Type, Oil Fired. (Recir.)

MOLDING MACHINES

5—MILWAUKEE Jolt Pin Lift 32 x 38" table.
1—J & J #612 Port. Rollover.
3—INTERNATIONAL "G", 22 x 8" Jolt Rollovers.
5—OSBORN Jolt Rollovers, Hand Draw, #142.
3—OSBORN 710J Jolt Squeeze Strippers, 16 x 25" table.
3—TABOR Jolt Squeeze in Head.
1—OSBORN #243 Jolt Rollover.
1—OSBORN #559 Jolt Stripper, 25 x 30" table.
1—DAVENPORT #28A Jolt Rollover.
3—HERMAN Rollover & Jar, 6000#, 60 x 80".
10—SPO #110 J Jolt Squeezers.
11—DAVENPORT #30-T Jolt Strippers.
2—OSBORN #405 Jolt Rollovers.
2—TABOR POWER ROLLOVERS, 30 x 40" table, 20" cyl., 12" draw.
1—TABOR Jolt Stripper, 20 x 20" table, 4" draw.

FURNACES—DIRECT ARC MELTING

1—150#/hr. "LECTROMELT".
1—250#/hr. Hydraulic Top Charge.
1—500#/hr. "LECTROMELT".
1—1000#/hr. ARNOLD.
1—2000#/hr. "LECTROMELT".
1—6 Ton HEROULT.
Several 3 Ton to 10 Ton capacity Side and Top Charge Furnaces.

FURNACES—
DETROIT "ROCKING" TYPE

1—60# cap. DETROIT, Single Phase.
2—200# cap. DETROIT, complete.
3—350# cap. DETROIT, complete.
1—1000# cap. DETROIT, complete.
1—3000# cap. DETROIT, less Transformer.

FURNACES—INDUCTION MELTING

1—20 KW AJAX Spark Gap High Frequency, 17 lb. capacity in steel.
1—40 KW AJAX Spark Gap, new. 50# capacity in steel.
1—166 KW AJAX, 60 cy. for aluminum.
3—333 KW AJAX-TAMA-WYATT for alum.
1—30 KW LEPEL—5# crucible.
1—175 KW, 960 cycle, M. G. Set with 1000# cap. crucible. New.
1—100 KW, 960 cycle, M. G. Set with 500# crucible.
1—100 KW, 9600 cycle, M. G. Set with 100# crucible.

FURNACES—OIL AND GAS

1—HAUSFELD Tilting #675, 250 cruc. Oil fired.
1—STROMAN Tilting, 125 cruc., Oil fired.
1—FISHER 4 Burner MNP, 1700#, gas fired.
3—WALKER YORK #400 cruc. tilting, coke fired.
2—HAUSFELD Tilting, 1200# Mag. Oil Fired.
3—MONARCH Oil Fired Stat., #60 cruc.
5—FISHER 400# Tilting, Oil fired.

CUPOLAS

2—#3½ WHITING w/Blowers.
1—#6 WHITING w/Skip Hoist & Blower.
2—#8 WHITING.
2—#9 WHITING w/Blowers.

CLEANING EQUIPMENT

1—PANGBORN G.K. 14 w/Loader.
1—PANGBORN G.K. 28 w/Loader.
1—27 x 36 AMERICAN TUMBLAST.
1—36 x 42 AMERICAN TUMBLAST.
1—42 x 48 AMERICAN TUMBLAST.
1—#1 AMERICAN MULTITABLE 45" dia. 6—15" Tables.
1—WATERBURY 2 compt. WET BARREL.
1—PANGBORN Air Blast Barrel, 30" cabinet.
1—4' x 6' x 1" Tumbling Barrel w/end exhaust.
1—2' x 5½' x 1" Tumbling Barrel w/end exhaust.
1—SLY BLAST ROOM, 8' x 10' x 7½". Complete w/Dust Collector.
5—SCREENERATORS—"S" and "M".
3—ROYER SAND BLENDERS.
2—SIMPLICITY SHAKEOUTS, 4' x 8'.
2—JEFFREY Portable SANDITIONERS.

SAND SLINGERS & CUTTERS

2—B. & P. Motive Jr., 19" head, Right and Left Arm.
2—B. & P. Tractor Type, 19" head.
6—AMERICAN SAND CUTTERS, Electric and Gas driven. All sizes.

BLOWERS & AIR COMPRESSORS

1—40 HP SULLIVAN, Model B-B-IM-S WL 60, with Receiver.
1—85 HP G. E. Cupola Blower, 24 oz.
1—25 HP I. R. Slow speed, horizontal, ER-1, 9 x 18.
1—40 HP SPENCER, 3600 CFM. 24 oz.
3—7½ HP FISHER, 16 oz.
3—5 HP NORTH AMERICAN, 16 oz.

CORE BLOWERS

1—CB-400 CHAMPION.
2—#2 REDFORDS.
2—#1 RANDALL.
1—#1 DEMMLER.
1—#92 OSBORN.

CONVEYORS

1—HEWITT-ROBINS SHAKER TYPE Vibrating Conveyor, 100' long.
1—JEFFREY, 28' long, 20" belt, troughing idlers.
1—LINK BELT, 50' long, 19" rubber belt, w/drive.
1—APRON FEED Conveyor, 10'7" ctrs. w/drive.
1—STEEL PLATE MOLD Conveyor, 90' ctrs., 30" belt, w/drive.
2—STEEL PLATE MOLD Conveyors, 90' ctrs., 24" belt, w/drive.

SAND LABORATORY EQUIPMENT

2—UNIVERSAL TENSILE MACHINES #401.
1—SAND RAMMER #315.
2—PERMEABILITY METERS.
1—#606 Test Core Baking Oven.

MISCELLANEOUS

3—CLARK FORK LIFT TRUCKS, 108" lift, Gas driven.
2—HOUGH PAYLOADERS, 1000# cap.
1—DEWALT Cutoff Saw.
1—#6 GARDENER Vertical Surface Grinder.
1—7½ HP CINCINNATI Grinder.
1—HOWE WEIGHOGRAPH Scale.
2—CHICAGO PNEUMATIC 1 Ton AIR HOISTS.
1—1 Ton D.C. SHEPPARD HOIST.
1—BLISS Sprue Cutter.
2—5 Ton Teapot LADLES, worm geared.
1—Bar Bending Machine, suitable for gaggers.
Lift Trucks—all sizes.
200 Tons of Cast Steel, Structural Steel, and Sterling Type Floor Flasks.
20 Tons of Core Plates, all sizes.
Roller Conveyor, all sizes.

ALL REBUILT AND GUARANTEED EQUIPMENT SOLD WITH FULL MONEY BACK GUARANTEE

UNIVERSAL
MACHINERY AND EQUIPMENT CO.
320 E. BROAD ST.
SHILLINGTON, READING, PENNSYLVANIA
PHONE: READING 7-1321

FOR SALE

AIR COMPRESSORS

1—150 H.P. 875 CFM Ingersoll-Rand two-stage air compressor, 220V, 3 ph. 60 cy. with air receiving tank.
1—40 H.P. 200 CFM Pennsylvania single stage air compressor, 220/440/3/60 with air receiving tank.
1—425 H.P. Chicago-Pneumatic Air Compressor, diesel driven, 20" low compression cyl., 12" high compression cyl., 14" stroke, complete with receiving tank.

AIR HOISTS

1—6-ton Detroit Pneumatic with trolley.
1—Ingersoll-Rand 6000 lbs. cap., installed on 4'6" x 8' frame with trolley and air motor for horizontal travel.
2—Ingersoll-Rand 4000 lbs. capacity.
1—Ingersoll-Rand 2000 lbs. capacity.
1—"Little Giant" LG12, 6000 lbs. capacity.
1—Thor, 6000 lbs. capacity.
12—Pendant Air Hoists, Curtis Class G 1 to 3 ton capacity.
8—Pendant Air Hoists—5" x 36" Cyl.

CONVEYORS

Roller Conveyor—Mathews—8", 10", 14", 30"-36" above rail.
1—Link-Belt Roller Type Power Mold Conveyor, 27'0" x 70'6" centers, 35 cars 38" x 72", to operate in a rectangular path at speed of approximately 45 ft. per minute, complete with structural steel supporting frame work, necessary take-ups, idler corners and driving mechanism with speed reducer, motor and controls.
1—Pigmold Conveyor, 64' sprocket centers, Link-Belt, complete with drive 220/440/3/60.

CORE BLOWERS

DEMMLER
1—#2K—weight of core up to 25 lbs.
1—#3E—weight of core up to 35 lbs.
1—CB-18 Champion
OSBORN
10—#92—weight of core up to 35 lbs.
1—#194-1—weight of core up to 100 lbs.

CORE-OVENS

1—2 Door Coleman, two rack type, gas and oil firing combination recirculating. All controls. Overall 14'10" x 15'8".
1—2 Door Despatch, recirculating, gas and oil fired. Doors 6'8" x 6'8". 16'0" x 16'0" overall. All controls.

CRANES

1—3 ton—3 motor Bedford bridge crane, 40' span, double built-up steel bridge with catwalk man cab, drum controls, roller collectors, 30 H.P. hoist motor, 10 H.P. travel motor, 3 H.P. Trolley motor, 220/440/3/60.
2—12' hand traveling bridge crane.
2—3 ton Shepard Cupola charging cranes, DC 550V., cab operated, complete with monorail.
Gib Cranes ¼ to 2 tons.

FURNACES AND BLOWERS

Furnaces:

STROMAN
2—200/225 NP hydraulic tilt, with blowers.
1—#14 Non-tilt.
CAMPBELL-HAUSFELD
1—#40 Crucible Non-tilt.
2—2000# IPNT electric tilting—2 burner gas or oil.
BELLEVUE
4—#200 with oil burner, hand tilting.
FISHER
1—#300 type MNP Nose Pour, electric tilting, 4 oil burners with 3 H.P. 440/3/60 blower.
1—#500 type MNP Nose Pour, electric tilting, 4 oil burners with 3 H.P. 440/3/60 blower.
2—#2000 Rotary hand tilting, oil-burner.

Electric:

1—6000 lbs. Heroult-Lectromelt Electric Furnace, 3000 KVA 13200 primary volts, 239-85 secondary volts, Delta Y with taps. 3 phase 60 cycles, complete controls.

Heat Treating:

LINDBERG
1—48" x 60" 1400° 90 KW 230 V. w/5 H.P. Blower.
G.E.
1—30" x 42" 1800° 37 KW 220 V. 1 ph. 168 Amps.

Furnace Blowers:

3—3 H.P. 220/440/3/60, 300 CMF 16 oz. pressure.
1—2 H.P. 220/440/3/60, 260 CMF 16 oz. pressure.

Cupola Blowers:

1—Spencer Turbine, 50 H.P., 220/440/3/60, 6750 CFM, 16 oz. pressure.
1—North American, 20 H.P., 220/440/3/60, 1950 CFM, 24 oz. pressure.
1—Piqua Size 5½, with 30 H.P., 220/3/60 motor.

Exhausters:

1—Sturtevant Silentvane, Size 75, 5 H.P. 220/440/3/60.
1—Ingersoll-Rand, 2075 CFM, 15 H.P., 220/440/3/60.
4—110 V. fans, 24" dia.

GRINDING EQUIPMENT

2—Fin Cleaning Machines for cylinder heads—Ireland.
1—#230 Gardner double end disc grinder, 30" wheels, V-belt driven.
1—#6 Cheesly disc grinder dir. connected 18" wheel.
1—10 H.P. Black & Decker direct drive double end grinder, 20" x 3" wheels, 220/440/3/60.
1—7½ H.P. #76 Safety Emery Wheel Co. dir. conn. double end grinder, 18" x 3" wheels, 220/3/60.
3—5 H.P. Safety Emery Wheel Co. belt driven double end grinders 18" x 3" wheel, 220V, 3/60.
1—7½ H.P. Universal Swing Grinder, 20/440/3/60.
3—20 H.P. Marschke Swing Grinders, 3/60/440.
2—#24 Gardner Horizontol Disc Grinder, 54" dia., 20 H.P., 220/440/3/60.
1—Standard dble. end disc grinder, 26" wheels, 10 H.P. 220/3/60.
1—15 H.P. U. S. Electric double end, 15 H.P., 440/3/60 motor.

LADLES

WHITING AND MODERN
24" and 27" diameter, 1500 to 2000 lbs. cap. Fully enclosed gear box for hand tilting.
1—3-ton Modern Teapot ladle, square bail.

MOLDING MACHINES

Jolt Rollover and Pattern Draw:

DAVENPORT
2—SA-28, 1500 lbs. jolt, 12" draw, 30" x 40" table, 1 w/air clamps.
1—SA-34, 2500 lbs. jolt, 15" draw, 34" x 48" table.
HERMAN
1—Pit-type, 6000 lbs. jolt, 42" x 60" table.
1—Pit-type, 9400 lbs. jolt, 40" x 84" table.
1—Pit-type, 10,000 lbs. jolt, 72" x 12'0" table.
JOHNSTON & JENNINGS
3—#918, 18" draw, 2000# jolt, 44" x 54" table, air clamps.
OSBORN
2—Model 405-95, 3500 lbs. jolt, 26" draw, 40" x 60" table.
7—Model 601, 900 lbs. jolt, 10" draw, 24" x 30" flask max.
11—Model 2047, 8" draw, 21¼" x 22¼" core box.
1—Model 422 w/swing out table.
SPO
1—#9336, 800# jolt, 9½" draw, 22" x 28" table, air clamps.
TABOR
2—22" x 32" Table, 600 lbs. jolt, 10" draw, with air clamps.

Jolt Squeeze Pin Lift:

INTERNATIONAL
1—LJSK Hand Lever Lift, 18" x 24" Table, 12" squeeze cyl.
MILWAUKEE
2—196 Roll-on, Roll-off, 3000# jolt, 19" squeeze cyl., 20" x 30" table, 10" draw.
OSBORN
2—814-P stationary, 8" draw, 700# jolt, 14" squeeze cyl.
1—#714PJ, table 20" x 31", 7" draw, 14" squeeze cyl.

Jolt Squeezer:

HAYNES
JOHNSTON & JENNINGS, 512-P "JACK RABBITT."
MILWAUKEE
MODERN
OSBORN—275-J, 210-PJ
SPO—110J
TABOR

Jolt Stripper:

DAVENPORT
1—34AJS, 2500# jolt, 12" draw, 36" x 46" table.
INTERNATIONAL
1—JFL, Foot Lever Lift, 3" draw, 600# jolt.
OSBORN
1—559HR, 1200# jolt, 6" draw, 25" x 30" table.
1—#561, 40" x 50" table, 12" draw, jolt 5000#.
HERMAN
2—40" x 60" table, 6000# jolt.

Rockover and Draw:

INTERNATIONAL
4—"R" hand ram, hand rollover, 8" & 10" draw.
MODERN
2—Air jolt, hand rollover.
OSBORN
1—147-1, 20" x 60" core box max.
1—146, 24" x 32" core box max.
2—36 Core Box Stripper.
SPO
1—#506, 24" x 25" table, 600# jolt, 10" draw, Stationary.
CHAMPION
4—Type W 22" hand rollover, 12" draw.
1—Type W 16" hand rollover, 8" draw.
PUSHOFF
4—Champion Pushoff 38" x 40"—10" draw.
1—Osborn Pushoff 3' x 16'.
PLAIN JOLT
1—Osborn No. 98, 220# jolt, 12" x 12x table.
1—Tabor Model B-4, 700# jolt, 18" x 24" table.
1—International Type J, table 36" x 48", 8" cyl.

SCALES

1—Car scale for cupola charges—Atlas Car & Mfg. Co.
1—6500 lbs. Toledo Floor Scale—Dial, 5' x 7' platform.

SAND SLINGERS

2—16" head Beardsley-Piper Stationary, 1200 RPM, 10 H.P., 220/440/3/60.
1—19" head Beardsley-Piper Motive Junior, 220/440/3/60.

SAWTABLE

1—Tabor Abrasive cutoff, 10 H.P. 3/60/220/440.

SHAKE-OUTS

ROBBINS
1—4' x 6', 8000 lbs. capacity, "Floatex".
1—4' x 10', 12,000 lbs. capacity with 7½ H.P., 220/440/3/60 motor, "Floatex".
SIMPLICITY
1—4' x 6' Model D, 16,000 lbs. capacity, 10 H.P., 220/440/3/60.
1—4' x 6' Model SOSH, 5 H.P. 220/440/3/60.

SAND MULLERS

1—#2 Model H, Style E, 14 cu. ft. per batch, 6' dia. pan.
1—#3 Model H, Style E, 30 cu. ft. per batch, 8' dia. pan.
3—#3 Model C, Style E, 30 cu. ft. per batch.
BEARDSLEY-PIPER
2—#70, 29 to 58 tons per hr., 18 cu. ft. per batch.
1—#40, 9½ to 19 tons per hr., 6 cu. ft. per batch.
LINK-BELT
1—Paddle type, 20" x 72".
1—Pugmill, 42" x 96".
1—#2 Blystone.

SAND PREPARATORS

2—American Sand Cutters, Type AA, 4'8" and 5'2".
1—Link-Belt Aerator with drive, complete.
1—Royer Sand Conditioners, NB-4, C-2, D-23.

SAND BLAST, TUMBLING AND DUST COLLECTING

1—Ruemelin air blast cleaning cabinet.
8—Cleaning cabinets for magnesium castings w/exhausters.
1—West Dust Collecting System, Uniwash Recirculating water type, Newcomb-Detroit, 5000 CFM complete.
1—Size 55 American Dustube collector, Type KD, 9'6" x 10'6" x 8'6", 1175 sq. ft. cloth area, 3300 CFM complete.
1—9' Rotoblast table—Mott Type SG Automatic.
1—8' Pangborn-Rotoblast table, Type LG.
1—6' Pangborn-Rotoblast table, Type LG.
1—Pangborn Rotoblast Barrel #12-GK14.
2—Pangborn Sandblast Cabinets EP-5-431.
1—Pangborn Sandblast Room—Walk-in type.
1—Sly Model 00 tilting type tumbling barrel with shot return.

ALL EQUIPMENT LISTED IS IMMEDIATELY AVAILABLE • ACT NOW AND SAVE

EUCLID FOUNDRY & MACHINE EQUIPMENT COMPANY

14919 SARANAC ROAD **TELEPHONE: GLENVILLE 1-1222** **CLEVELAND 10, OHIO**

FOR SALE

MOLDING MACHINES

3—**SPO** No. 506 Jolt Rock-Over Pattern Draw Machines, 24" x 25" table, 10" draw, 600 lbs cap Portable or Stationary.
2—**SPO** No. 507 Jolt Rock-Over Pattern Draw 32" x 40" table, variable draw 10" to 20", 1500 lbs cap. 1948 models.
1—**SPO** No. 508 Jolt Rock-Over Pattern Draw Machine, 28" x 30" table, draw 9" cap. 1200 lbs. Jolt cap.
1—**SPO** No. 413-D Jolt Squeeze Power Rock-Over Pattern Draw Machine 24" x 25" table, 10" draw, 600 lb cap. max. flask size 26" x 36". Stationary.
2—**SPO** No. 2114G, Jolt Squeeze Strip Machines 20" x 27" table, 4" draw, 600 lb.
1—**SPO** No. 213-D Jolt Squeeze Strip Machine table 19" x 28", 8" draw, 800 lbs.
7—**SPO** No. 110J Jolt Squeezers, Portable.
1—**OSBORN** No. 721 Jolt Squeeze Pin Lift Machine, Cantilever squeeze head, 22" x 26" table, 10" draw.
3—**OSBORN** No. 559HD, Stationary Jolt Strippers 25" x 30" table. 1200 lbs jolt.
2—**OSBORN** No. 601 Jolt Rollover Pattern Draw Machines, 600 lbs cap. overall flask 30". Ideal for Core Work.
6—**OSBORN** No. 275 J, Jolt Squeezers 16" x 20" table, portable or stationary.
6—**OSBORN** No. 75J Jolt Squeezers, 16" x 20" table, 10" cyl. Ideal for Shell Molds.
2—**OSBORN** No. 142 Jolt Rollover Foot Draw 14½" x 24" table, 8" draw, 350#.
1—**HERMAN** Jolt Rollover Pattern Draw Mach. 40" x 58" table, 3000 lbs cap. 18" cyl. serial #1837, 1945 unit.
2—**HERMAN** 40" x 60"—13" Diam. Cyl. Heavy Duty Bumper Plain Jolt Machine.
1—**JOHNSTON & JENNINGS** No. 918-B Jolt Rollover Pattern Draw, 44" x 54" table, 18" draw 3000 lbs capacity.
2—**JOHNSTON & JENNINGS** No. 815-B Jolt Rollover Pattern Draw, 30" x 40" table, 15" draw, 1500 lbs cap. air operated head.
1—**TABOR** 22" Shockless Jar, Rollover & Pattern Draw, 22" x 42" table, 10" draw, 600 lbs cap. portable.
1—**TABOR** 30" Shockless Jar Rollover & Pattern Draw, 30" x 50" table, 12" draw, 1000 lbs. cap.
2—**INTERNATIONAL** RES Jolt Squeeze Rollover Draw Size 15" x 8" draw, flask cap. 24" x 42" O.D.
1—**INTERNATIONAL** PKL Jolt Squeeze Air Pin Lift 18" x 24" table, 5½" draw, 12" squeeze cyl.
2—**INTERNATIONAL** G Jolt Rollover Foot Draw 18" x 56" table, 8" draw, (other 20" x 8").
1—**DAVENPORT** #28A Jolt Rollover & Pattern Draw 30" x 40" table, 12" draw, 1500 lbs cap.
1—**MILWAUKEE** #1030 Jolt Pin Lift, 28" x 34" table, 12" draw, 1000 lbs cap.

SAND PREPARATORS

8—**BEARDSLEY & PIPER** Models "S"-"M"-"L" Screenerators, portable units.
1—**BEARDSLEY & PIPER** "Nite Gang" Serial No. SNG I-491—NEW in 1950.
1—**BEARDSLEY & PIPER** #70 Portable Sand Preparators with magnetic separator, 90 cu. ft. hopper, gyrating screen, aerator, 1946 unit, ser. #SC-73.
1—**AMERICAN** Sand Cutter Model AM, size 69/45—serial #176—motors enclosed.
1—**AMERICAN** Sand Cutter Model BD, size 75/60—serial #722—motors enclosed.
1—**ROYER** Model NC-4 Portable Sand Conditioner, 12 to 15 tons per hour cap.
2—**ROYER** Model C-2 Portable Sand Conditioners, 25 to 30 tons per hour cap.
1—**ROYER** Model NB-2 Portable Sand Conditioner, 7 to 9½ tons per hour.

SHAKEOUTS

1—**ROYER** Shakeout & Sand Conditioning Unit. Serial No. ST-47.
1—**SIMPLICITY** 4' x 6' Model B Serial No. 46-SOB-145. 5000 lbs cap.
1—**SIMPLICITY** 4' x 8' Model BG, Serial No. 48-SOBG-185, 5000 lbs cap.
1—**SIMPLICITY** 2' x 3' Gyrating Sand Screen—single deck—Model CA—Motorized.

CORE BLOWERS

3—**OSBORN** No.'s 91 & 92, with air clamps.
2—**REDFORD** No. 1, Cartridge Bench Type.
1—**DEMMLER** No. 1-E with Air Clamps.
1—**DEMMLER** No. 2 with Air Clamps.

AIR & ELECTRIC HOISTS

4—**INGERSOLL RAND** Size C, 2000 lbs cap. cable wound, latest-type, 15' lift.
7—**INGERSOLL RAND** Size D, 4000 lbs cap. cable wound, latest type, 15' lift.
1—**INGERSOLL RAND** Size DR, 2000 lbs cap. cable wound, 25' extra long lift.
2—**INGERSOLL RAND** Size E, 10,000 lbs cap. cable wound, latest type, 15' lift.
1—**CHICAGO-PNEUMATIC** Model A, 1000#
1—**ELECTRO-LIFT** 3000 lbs capacity, low head room, cable type, 4 Hp motor.
4—**AMERICAN** Engineering Type A1, 2000 lbs cap. 220/3/60 cycle, for tramrail.
1—**SHAW BOX** 3 ton capacity "Load Lifter" 220/440/3/60 cycle, on 20' crane span.
1—**DETROIT** 5 ton cap. Model LHR, 440 volt Ser. #19317E 1953 unit.

SAND BLASTING EQUIPMENT

1—**AMERICAN WHEELABRATOR** 27" x 36" Tumblast with skip hoist, shot return and all electrical, 1948 unit.
1—**J. W. PAXTON** Upright Sand Blast Cabinet with pressure tank & accessories.
1—**PANGBORN** #GK 14, Roto-Blast Barrel, with bucket loader etc. 14 Cu. ft. cap. drum size 36" x 49", 1943 unit.
2—**PANGBORN** EP-5 Shot Blast Cabinet 5' x 4' x 7' with shot return, pressure tank, nozzles, etc.
1—**PANGBORN** Shot Blast Room, 10' x 10' x 12' walk-in type, with pressure tank, nozzles, hoses, elevator etc.
1—**PANGBORN** Roto-Blast Table 9' Diam. with 8-27" tables, model LG-2.
1—**PANGBORN** Roto-Blast Table 6' Diam. with 8-27" tables, model LG-2.
1—**PANGBORN** Roto-Blast Table 6' Diam. with 6-20" tables, Model LG.

TUMBLING BARRELS

1—**WHITING** 30" x 60" with 5 HP Gearhead motor & drive, 1952 unit.
5—**SLY** 36" x 60" with 5 HP Gearhead motor & drive—built-in magnetic brake.
2—**SLY** 42" x 72" Square 10 HP Gearhead motor & drive—built-in magnetic brake.
1—**SLY** 42" x 66", Type C, 10 HP gearhead motor drive—built-in magnetic brake.
4—**SLY** 36" x 72"—Flat Belt Drive.
1—**NEW HAVEN** Air Blast Barrel 42" x 48" with motor & drive etc. 1942 unit.

B & P SAND SLINGERS

1—**B & P** Tractor Type 13'-6' arms, 4' impeller head, 4" liner & cups, 19" head, with spare head 22"-5" liner & cups—25 HP, 1941 unit.
1—**B & P** Tractor Type 13' with magnetic tower, 16" head, 4' ramming unit, 4" tip, 1946 unit.
1—**B & P** Stationary Model DB, 6' arm, 4' impeller, 16" head, 4" tip with 5 ton plate feeder 10' x 7' chain drive & motor.

CUT-OFF SAWS & MACHINES

1—**TABOR** Type C10AF, cut-off saw, with 10 HP motor, serial No. 24626.
2—**TESSEMER** Model H, Sprue Cutter ¾" cap. brass, with 3 HP motor.
2—**CLIMAX** #2A Wire Straighteners, 4 Sizes 1/16" to ¼" with 1 HP V-belt.

CORE OVENS

2—**DESPATCH** Drawer Type, rail supports, controls etc 59" deep, 9" high, 1944
3—**GEHNRICH** Single compartment recirculating gas fired, with all controls etc. 6' W x 11' L x 7' H walk-in type.
1—**INDUCTION DIELECTRIC** Model M-840A, 600 lbs per hour, cores 8" H x 24" W, 15 KVA, 220 V. 100 amps, transformer 60 cy. 3 ph. water cooled, belt 24" x 52", 1950 unit, used 300 hours.

GRINDING EQUIPMENT

2—**FOX** No. 5 High Speed Stand Grinders, wheel size 24" x 3" w/10 HP motor.
2—**HAMMOND** WR-1 Double End Snagging 7½ HP—wheel size 20" x 3" x 10"
1—**HAMMOND** WR-1 Double End Snagging 10 HP—wheel size 24" x 3" x 10".
1—**STANDARD** #30 Double End Multi-Speed Model 101—10 HP—wheel 24" x 3".
1—**U.S.** Double End Snag, Model 65, 20 HP-4 speed unit, wheel 24" x 3".
1—**MARSCHKE** Swing Frame, 3 HP-220/440.
3—**MARSCHKE** Swing Frame 15 HP 2 speed unit, wheel size 24" x 3"" x 12".
3—**MARSCHKE** Swing Frame 20 HP—3 speed units, wheel size 24" x 3" x 12".
1—**QUEEN CITY** Model 100 Double End Disc, 10 HP motor, wheel 20" x 2" x 2". x 2".

CONVEYORS—ROLLER-APRON-BELT

1000'—**MATHEWS** Gravity Roller, 10" wide 2½" roller dia. 4" centers.
700'—Gravity Roller—24" wide—2¾" diam. 4" centers, 4" channel, above rail.
1—**FARQUHAR** 18" x 35' Model 343, portable trough with 5 HP motor and elect.
1—**FARQUHAR** 18" x 19' Model 341 Undercar unloader, rubber belt, 5 HP motor.
1—**LINK-BELT** Steel Apron 18" x 24'.
1—**LINK-BELT** Steel Apron 24" x 20'.
125'—**LOUDEN** Monorail, complete with four 20' bridges and all accessories.

ELECTRIC FURNACES

3—**DETROIT** Type AA, Rocking, 1500 to 2000 lbs cold charge, w/400 KVA transformers 4650 primary volts, single phase.
2—**DETROIT** Type AA, Rocking, 750 to 1000 lbs cold charge, w/250 KVA transformers, 4650 primary volts, single phase.

SAND MULLERS

2—**SIMPSON** No. O, style B & C, 3' pan diam. 175 lbs batch, 5 HP V-belt drive.
1—**SIMPSON** No. 1 style B, single wheel type, open gear, 4' pan diam. 400 lb. batch size, with 5 HP motor and reducer.
2—**SIMPSON** No. 1 H, style K, Unit Drive type, 4" pan diam. 500 lbs batch, 2 muller wheels, w/ 5 HP Master unit drive.
1—**SIMPSON** No. 1½ style UD, unit drive type, 4' 6" pan diam. 700 lbs batch size, with 7½ HP Master Unit Drive.
1—**SIMPSON** No. 2, style UD, unit drive type, 6' pan diam. 1500 lbs batch size, with skip hoist loader and all electrical.
1—**SIMPSON** No. 2, Open Gear Type, with motor & drive wheel.
5—**SIMPSON** No. 3, Style C, Separate Drive Type, 8' pan diam. 3000 lbs batch size, with 50 HP motor & Falk Speed Reducers, serial No.'s in 58,000's, 1946 units. Enclosed Gearing.
1—**BEARDSLEY & PIPER** No. 60 Speed Muller, Model G, 10 cubic ft. batch size, with 50 HP motor and all electrical.
1—**BEARDSLEY & PIPER** No. 30 Speed Muller 3 cubic ft. batch size, with motor & electrical, serial No. 30-2.
2—**BEARDSLEY & PIPER** #3½ Mulbaro's portable, 3½ cubic ft. batch size.
2—**CLEARFIELD** No. 404 Sand Mullers, 4' pan diameter, with 5 HP Master Motor.

GAS & OIL FIRED FURNACES

3—**LINDBERG-FISCHER** Model MNP, size 2400 for aluminum, gas or oil fired, with motors-blowers, NEW pots, electrical tilting mechanisms.
5—**LINDBERG-FISCHER** #400 Crucible. Type BBI, hand tilting, gas or oil fired, with motors-blowers, 1950 units.
1—**STROMAN** #600, Model U Tilting Reverberatory, gas or oil fired, w/motor-blower, 1949 unit.
3—**STANDARD** #30-#80-#150 Crucible, Stationary gas or oil fired, w/motor-blower.
1—**YORK-WALKER** #28 Hand Tilting, #300-400 crucible, coke fired, w/motor-blower.
4—500# Aluminum Holding Furnaces, NEW lining, with motor-blower.

CUPOLA & FURNACE BLOWERS

1—**GE** Centrifugal Type FS3670-9400 Serial #27006, w/motor 100 HP, 3600 RPM.
1—**BUFFALO FORGE** No. 7-E, 25 HP-32 oz. 1600 CFM, 28" wheel.
9—Furnace Blowers 1-2-3-5-7½ HP-16 oz.

LADLES & POURING DEVICES

10—**WHITING** Riveted Crane Ladles, taper side with V-bail (E-Z Pour) enclosed gearings nose pouring, ½-1-2-3-4-5 ton.
6—**MODERN** 1500# Cylindrical Geared, with crane bails & floor stands, NEW covers, 30" dia x 29" L.
3—**MODERN** Mixing Ladles, on trunnions, geared, covered & lined, (2-40" x 60") 1-36" x 36", with preheaters.
6—**INDUSTRIAL,** Lip pour, 24" diam, x 24" H, 1600 lbs cap. Enclosed Timken worm gear for tilting.
12—**WHITING** Models 1000 & 2000 Pouring Device w/500# ladles, hand tilt devices & trolleys.
6—**MODERN** Models F-FA-FA-9 & F-9 Pouring Devices with 500 Lb. covered ladles, trolley, & hand Tilt devices.

BUCKET ELEVATOR

1—**JEFFREY** 50' centers of drive pulleys, 106' belting 13", with continuous type buckets, Jones Reducer, motor etc.

CUPOLA CHARGER

1—**WHITING** 3 Ton Tiger Monorail, type 2 motor wishbone charger, cab operated, with controls, 5 buckets etc. 80' tram beam track & conductor. Buckets 48" x 52" w/ super structure, controls, etc. 1953 unit.

MISCELLANEOUS

Large lot Air tools, rammers, chippers, grinders etc., all mfgs. cupola charging buckets 42", Dietert Sand Test equipment, flasks, steel, and aluminum, **SEND FOR COMPLETE LISTING** of numerous other items.

AAA MACHINERY & EQUIPMENT CO.

15539 SARANAC ROAD *Members of American Foundrymen's Society* **CLEVELAND 10, OHIO**

Electric Melting Furnaces

LECTROMELT 1 Ton, Side Charge. 800 KW transformer 12000 Volt primary. Late type unit. In place Chicago, complete.

LECTROMELT 500# Type T Side Charge. 300-375 KVA Transformer GE Circuit breaker. Moore controls 2300 volt primary current. Late type, now in our warehouse Chicago.

DETROIT ELECTRIC, 1500# capacity, 13,200 primary voltage. Kuhlman transformers. Complete with controls.

2—Swindell 6 ton Duplex Furnaces, 9 ft. diameter shells, like new.

DETROIT ELECTRIC 350#, Type LFA with Kuhlman transformers and oil circuit breaker. 13,200 primary voltage.

DETROIT ELECTRIC with 350# and 1000# tapered shells, 2300V Kuhlman Transformer. Complete with panelboard and bus bars.

1—9' dia. shell Swindell type electric furnace, complete.

1—2500 KVA Westinghouse Furnace transformer, 13,800 V Primary.

1—2500 KVA Westinghouse Furnace transformer, 11,000 V Primary.

ACME EQUIPMENT CO., INC., 126 South Clinton Street, Chicago 6, Illinois, Phone: Andover 3-3430.

FOR SALE

AIR COMPRESSORS

Ingersoll Rand Type 10—14 x 9 x 12, 2 stage, 75 HP, 3/60/220/1200 rpm synchronous motor, 350 CFM at 100#.
5 x 5 Ingersoll Rand 10 HP motor.

BLOWERS

Spencer Turbo Blower, 2250 CFM at 16 oz. 15 HP 3/60/220 totally enclosed motor. New 1947.
Ingersoll Rand Motor Blower Type FS. Single Stage 4000 CFM @ 3.75 PSI, 100 HP, 220 V. G.E. Induction Motor.
Buffalo 7E Direct Connected Blower, 50 HP Westinghouse motor, 3/60/220-440 V, 3535 rpm, 28" wheel, 3500-4000 CFM at 32 oz. Flanged outlet.
Spencer Turbo Blower, New 1949. 3500 cfm, 28 oz. with 40 HP 220-440 motor and Foxboro controls.

CONVERTER

100 KW Rotary Westinghouse 220 V 60 cycle primary 250 V DC, complete with controller and panel.

CORE BLOWERS

International SB 13.
Federal Sandblo CB40B, like new.

CORE OVENS

3—Section Foundry Equipment Co. Gas fired, 5 drawers per section.
4—Section Foundry Equipment Co. Gas fired, 5 drawers per section.

CRANES

5 Ton P & H Overhead Elec. Traveling Crane, 30'6" span, 15' lift (can be increased) 3 motor, 220 V A.C. New 1946.
10 Ton Northern Overhead Elec. Traveling Crane, double girder, fish belly, 3 motors, 230 V D.C., 54'7½" wide C to C of wheels can be cut down to fit smaller size.

CRUSHERS—PULVERIZERS

1—Stedman 15" x 12" Type A. With 10 HP 220-440 V motor.

GRINDERS, DISC

Besley 20S Double End 26" x 2¾" wheel with 2 compound tables, V belt drive, 15 HP, 220-440 totally enclosed motor, magnetic starter controls.
2—U. S. Model 80 Double End 2-18" dia. wheels, 7½ HP motor, 2 swinging tables 8" x 14"—1 with hand lever feed.

GRINDERS, SNAGGING

McCabe 2" x 24" wheels, 48" between wheels, 3/60/440 V.
1—Hammond type 20 WR2—3" x 24" wheel, double end grinder, single speed, 20 HP Louis Allis Squirrel Cage, 220-440 V—1760 rpm motor.
1—U. S. DE, Model 65, 3" x 24" wheels, variable speed, 20 HP motor.
Hisey Wolf adjustable speed 15 HP 30" x 3" wheels, 220/440 V motor.

GRINDERS, SWING

2—Fox 10 HP 3/60/220-440 V, Swing Frame.
U. S. 15 HP, 3/60/440 V Swing Frame, 2 speed.
Fox 15 HP Swing Frame, 2 speed.
Marschke 20 HP, 2 speed.

HOISTS

1000# Cleveland 220/440 V.
1000# Detroit 220/440 V.
5—1000# P & H Hevi Duty with trolley.
2—2000# P & H Hevi Duty with trolley.
11—4000# P & H Hevi Duty with trolley.
2—4000# P & H Hevi Duty with trolley and powered drive unit for moving hot metal.

LADLES

1 Ton Enclosed Gear Crane Ladle truck type 4 wheel car for 18" gage track, Whiting Junior.

MOLDING MACHINES

2—Champion Pin Pushoffs, 38" x 40"—12" draw.
1—Johnston & Jennings 1015 Jolt Pin Lift, 30" x 38" table.
1—Champion Hand ram, hand clamp, hand rollovers 26" x 14" table.
1—Champion Hand Ram, Hand rollover, Hand draw core machines, 15 x 15 bed.
3—Davenport Portable Jolt Rollover Pattern Draw 20" x 24" tables, open end, 8" draw.
1—International Type G 24 x 10 Jolt Rollover, foot draw, 22 x 30 table, 10" draw.
1—Herman Molding Machine Jolt Rollover Pattern Draw, 20 x 30.
1—Herman Molding Machine Jolt Rollover Pattern Draw, 20 x 36.
1—International Type G 30 x 12 Jolt Rollover Foot Draw, 28" x 36" table, 12" draw.
1—International Type G 30" x 30" table, 9" draw, Portable.
2—International Type G 18" x 56" table, 8" draw, Portable.
1—International Type F Jolt Rollover 27 x 12, 12" draw, 35" x 26" table.
1—International Jolt Rollover Pattern 10" Draw, 22" x 30" plate, 6" jolt cylinder.
1—International Plain Jolt Molding Machine 48" x 60" table, no pit required.
1—Herman Jolt Rollover Pattern draw, 40" x 84" table, slotted nickel alloy table over regular table to accommodate various sized flasks, air clamp, new 1946. Used very little.
1—Herman 20" x 30" rollover pattern draw, 750# series. Air clamp.
2—Herman 20" x 24" Jolt Rollover Pattern Draw, 750# series. Air clamp.
1—Herman 4000# Series High Speed Rollover 30" x 60" with 32" x 48" bumper, 13" cylinder pattern device.
2—Milwaukee Arm Type Jolt Squeeze Strippers, 1500# capacity, Model 163-50 Serial 13104-5, 15" x 24" table, 16" x open end, pattern size. Late type.
1—Osborn 76J Portable Jolt Squeeze Molding Machine 12" cylinder.
3—Osborn Jolt Squeeze Molding Machines, 275J, 16 x 20 table, tilt back head.
2—Osborn 405 Jolt Rollover 40" x 70", 2000# capacity, 20" x 60" jolt table and 4 wheel receiving car.
1—Tabor 1000# Rollover, 30" x 60" table.
4—Spo 214 Jolt Squeeze Pin Lifts.

MULLERS AND MIXERS

Simpson #2 Motor on base.
Simpson #3 Motor on base.
Simpson #3 Type H open gear type.
Simpson #3 Open Gear Type. $1000.00.
American Model M Sand Cutter, 70" blades.
Royer NDP 47 14" Belt, 4 rubber tires.
B & P #60 with skip loader.

PREPARATOR

B & P #70 Preparator. Only used 3 months.

ROTOBLAST

Pangborn, table with 3-8" rotating work tables, 3 position loading, cleaning and touch-up designed for work similar in size to aircraft cylinders. Like New condition.

SHAKEOUTS

2—4' x 6' Simplicity.

SPEED REDUCERS

We have a large stock of speed reducers and geared head motors. Write us your needs.

TUMBLING BARRELS

2—Sly 42" x 48" dia. barrels, master geared head motor drives.

WHEELABRATORS

1—American Wheelabrator 48" x 48" with loader, 220/440 V motors.
1—American Wheelabrator 36" x 42" with loader, 220/440 V motors.

WIRE STRAIGHTENERS

2—Climax 1 HP motor.

ACME EQUIPMENT CO., INC.

WE WILL BUY FOR CASH A SINGLE PIECE OF EQUIPMENT OR YOUR ENTIRE FOUNDRY

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$60,000.00 Worth of Modern Foundry Equipment Purchased New in 1949-1953 "Formerly Belonging to the Basic Foundry Co. in Huntington, West Virginia". Must Be Liquidated from Premises in 30 Days.

2—**OSBORN** 275 J Portable Jolt Squeezers. New 1949.

1—**U. S.** Double End Grinder Model 500. Floor Model. 2 H.P., 220 V., 3 Ph. New 1953.

1—**GROB** Band Saw. Model NS 18-10. Ser. No. 5561, BW-1 Butt Welder Ser. 11473, Cut-off, etc. New 1949.

1—**AMERICAN WHEELABRATOR** Swing Table 66" Dia. Motor Control Panel, Timer, Voltage 220/440, with Dust Collector. New 1949.

1—**HOUGH PAYLOADER** Model HA, complete with 48", 12 cu. ft. sq. Nose Bucket. Ser. No. 25908. New 1953.

1—**HOUGH PAYLOADER** Model HA, Rebuilt Completely by Hough. Hydraulic Control Bucket, Ser. No. 14783.

2—**NEWAYGO HANDY SANDYS,** Model HS-7—GT, Double Hopper Units, with Sand Bins, Cross Magnetic Separation on Feeder Conveyor, Heavy Vibrating Screen on Hoppers, 15" Air Operated Gates. New 1953. Used with Spo Molding Machines 2146.

4—**SPO** No. 2146 Stationary Jolt Squeeze Strip Molding Machines, Inverted Jolt, Post Type Squeeze Head Table 23" x 31", Squeeze Cyl. 14", Draw 6", Jolt Cap. 1000 lbs. New 1953. Ser. Nos. 269, 270, 263, 264.

1—**REDFORD** No. 2 Core Blower, with Clamping Attachment. Ser. No. 2-23-611. New 1953.

100' **MATHEWS** 24" Roller Conveyor, 2½" Rollers, 3" centers, 3" channel, with Adjustable Stands. New 1953.

110' **MATHEWS** 16" Roller Conveyor, 2" Rollers, 3" centers, 3" channel.

1—**BEARDSLEY & PIPER** Speed Muller. #50 with Bucket Loader. & 50 H.P. Motor & Electrical.

1—**BEARDSLEY & PIPER** Sand Preparator #40, Shaker Screen, Magnetic Pulley, Aerator, Water Device. Used in conjunction with Speed Muller.

1—**PORBACK** Portable Core Sand Mixer, 3½ cubic ft. capacity with 1½ H.P. Motor, on Pneumatic Tires. Ser. No. 14652.

1—**HINES** Pop-Off Flask, 20" x 26" Heavy Duty 6" Cope, 6" Drag with 10 20" x 26" x 8" Jackets.

1—**HINES** Pop-Off Flask, 24" x 30", 8" Cope, 6" Drag.

1—**PORBACK** Core Oven, Model C-3-C Gas Fired, Double Drawer Type, Minn.-Honeywell Controls.

1—**CHICAGO PNEUMATIC** Air Compressor, 8" x 8", Horizontal with new tank.

1—**U. S.** Vertical Disc Grinder. 7½ H.P., 18" Wheel. New 1953.

1—**CLEVELAND TRAMRAIL SYSTEM,** 100' with 4—42' Bridges and Trolleys. Complete.

1—**STROMAN** Stationary Melting Furnace, Crucible Type, 38" dia. gas fired. Style 1201, with 2 H.P. Blower. New 1953.

1—**STROMAN** Tilting Melting Furnace, Style 2750 H, 500 lbs capacity. Ser. No 1513 with Motor and Blower. New 1953.

1—**DIETERT** Mold Hardness Tester.

1—**DIETERT** Speedy Moisture Tester, 0-10%.

1—1-Ton **BUDGIT** Electric Hoist with "I" Beam Trolley.

4—**CURTIS** 3" Dia. x 4" Stroke, Class "G" Air Hoists. New 1953.

3—**DELTA** Drill Presses with ½ H.P. Motor.

1—**UNCA** Conveyor System with Dip Tank. Complete.

2—½ Ton Load Lifter Jr. Electric Hoists.

1—**ROTOCLONE** Dynamic Precipitator Ser. No. 14044.

2—**WARNER & SWASEY** Turret Lathes. No. 4, Serial No. 241541, rebuilt.

1—**ROYER** NC 4, pneumatic tires. New 1953.

1—Open Dial Face Platform Scale, 6,000 lbs. cap., 3' x 5' Platform, pit type.

Phone, Wire or Write:

AAA MACHINERY & EQUIPMENT CO.

15539 SARANAC ROAD — *Members of American Foundrymen's Society* — **CLEVELAND 10, OHIO**

LI. 1-6545

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6 inches	85.50	79.00	72.50	66.00
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8 inches	109.00	100.50	92.00	83.50
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FOUNDRY

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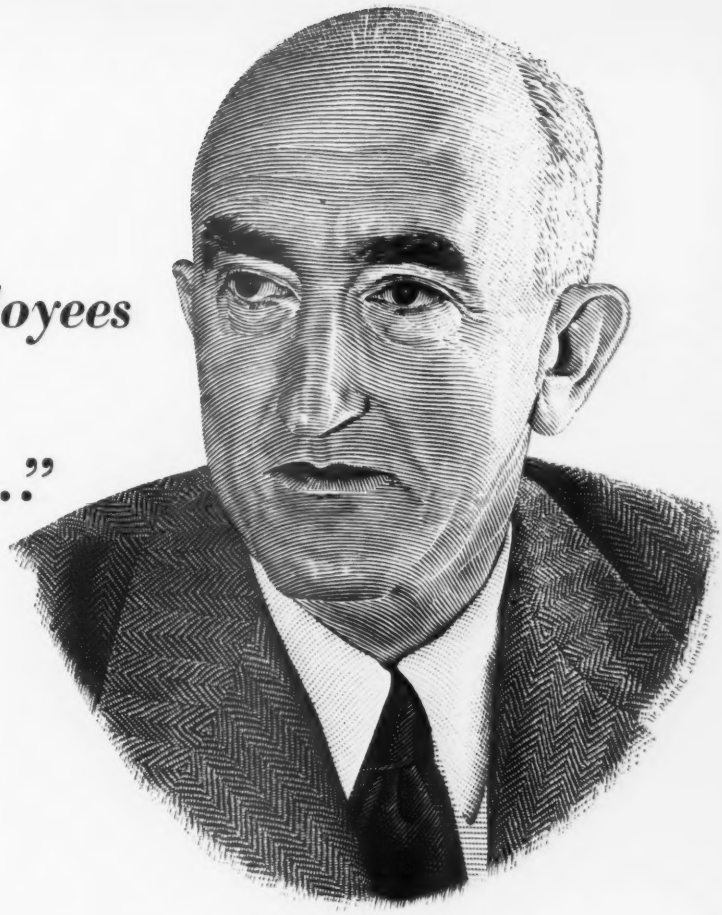

WILLIAM M. ALLEN
President
Boeing Airplane Company

"Boeing's 59,000 employees feel closer to the company since our recent successful person-to-person payroll savings drive in the Seattle and Wichita Divisions. Through letters and personal observations many employees have told us they have a greater sense of being a part of the company—that Boeing is interested in the welfare of each and every man and woman on the payroll."

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The United States Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, the Advertising Council and

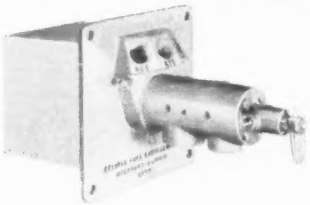
FOUNDRY
A PENTON PUBLICATION

Burning Issues

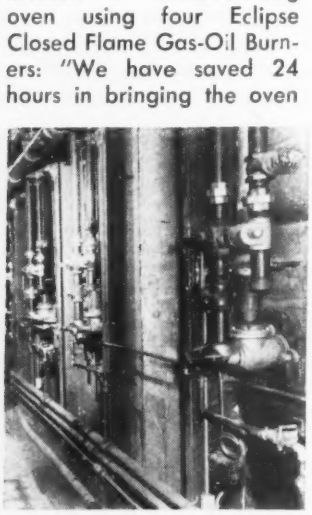
Eclipse

Published by Eclipse Fuel Engineering Co.
Rockford, Illinois

How new Eclipse Burner cut heating time 24 hours for Eastern Foundry!

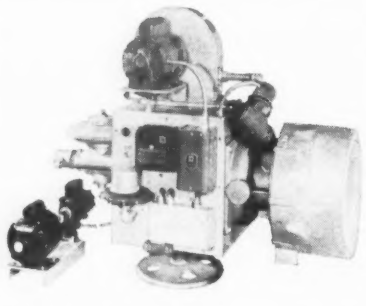


Here's good news from an Eastern foundry that modernized a malleabilizing oven using four Eclipse Closed Flame Gas-Oil Burners: "We have saved 24 hours in bringing the oven up to temperature. Our products are more uniform, and there is a definite improvement in quality. We have also experienced considerable savings in fuel and supervision time."



Reasons for these savings are the extreme flexibility of the burners and turndown characteristics when burning gas . . . along with ease with which they are controlled in a proportioning system. Changing fuels is simple, too. And the new *dual atomizing* principle in which air and fuel mixture are injected in *converging* and *rotating* patterns, assures "top" combustion efficiency. Truly flexible design, which permits any desired alignment of piping, fast installation, and easy servicing, make it the ideal conversion burner for the foundry industry. Four sizes, up to 2,000,000 BTU/hr. max. Write for Bulletin R-200.

Announcing UL Approval . . . new, larger sizes of Eclipse Combination Gas-Oil Burners



Ideal conversion burners for large ovens and furnaces, the new Eclipse "SP" is now approved by UL, as well as by city boards in Omaha, New York City, Minneapolis, Cleveland, Dayton, and St. Louis. Save fuel costs today by converting to this completely packaged, easy-to-install system, available for firing rates up to 3,000,000 BTU/hr. Exclusive "rotary combustion" assures maximum heating efficiency. Instant, automatic fuel changeover. Automatic, *electronic* flame failure protection for both gas and oil flames. Write for Bulletin R-100.

Eclipse Fuel Engineering Co.
1125 Buchanan Street, Rockford, Illinois
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- Recognized sourcebook of information on how to eliminate casting defects.
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IMS

SILICONE BOMB SEPARATOR

SHELL MOLDERS!
CHECK
THESE FEATURES

- ✓ Wets and adheres to all metal surfaces.
- ✓ Does *not* affect permeability of shells.
- ✓ Will *not* form carbonaceous deposits.
- ✓ Completely stable at all molding temperatures.

PRICES

Sample Can	$ 2.00
Unbroken dozen	18.00
Unbroken gross	197.40

Minimum Freight Allowed
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INJECTION MOLDERS SUPPLY CO.
3514 LEE ROAD WYoming 1-1424 CLEVELAND 20, OHIO

ANDREA

Slot Widths
.010 .014 .016 .018

TYPE 'R' CORE BOX VENTS

The VENT with RECESSED HEAD and CHAMFERED LEADING EDGE affording easy insertion with less slot distortion plus maximum air pasage.

All sizes with deep or shallow head or to your specification.

ANDREA MANUFACTURING COMPANY
180 NORTH WACKER DRIVE CHICAGO 6, ILLINOIS

WELLMAN *Williams Type*

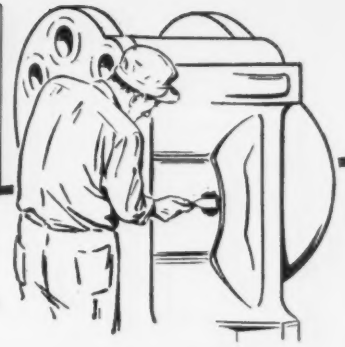
INSTANT "ON-AND-OFF" SERVICE ANYWHERE

The Wellman "Hook-on", single-line bucket is designed to provide clamshell bucket service at any crane hook where suitable head room and hoist capacity are available.

Hook the yoke over the crane hook and the bucket is ready for work. When the job is finished, take the yoke off the hook and the crane is free for other duties.

Capacities from ⅜ to 2 cubic yards. Write for free bulletin.

THE WELLMAN ENGINEERING CO. 7044 CENTRAL AVE. CLEVELAND 4, OHIO



These features mean BETTER LOOKING CASTINGS

TIGHT, LASTING REPAIRS

When correcting blow or sand holes, surface blemishes, or rough and porous areas in castings, you can depend on Smooth-On Foundry Cements, standard of the industry for more than 55 years. They are easy to apply, harden quickly, stay firmly in place.

FOUR DIFFERENT SHADES

With 4 different shades to pick from, you know you can get a close match for your castings.

4AA—Light gray, fine texture
4A —Medium gray, medium texture
4B —Dark gray, coarser texture
also
9—Bronze or Brass

UNIFORM QUALITY

Rigid quality control means you can be sure that the strength and color of Smooth-On Foundry Cements will not vary from one order to the next. Every lot of Smooth-On cements is laboratory tested and must satisfy tests for setting time, hardness, and color before it is packed for shipment.

FREE SAMPLES

Why not try one or more of these Foundry Cements at our expense? We will be glad to send you a free sample of any of the cements described above if you will write us on your business letterhead. Write today, and see how Smooth-On can improve the appearance of your castings.

SMOOTH-ON MFG. CO. DEPT. 17
570 Communipaw Ave., Jersey City 4, N. J.

SMOOTH-ON
FOUNDRY CEMENTS

SO-389

Curved, monorail loops — with turntables, transfer and tongue switches — can be designed to serve the most congested areas at cupolas.

Long spans of distributing monorail; like that shown below, have served well for a quarter century.

MODERN SPEED AND SAFETY

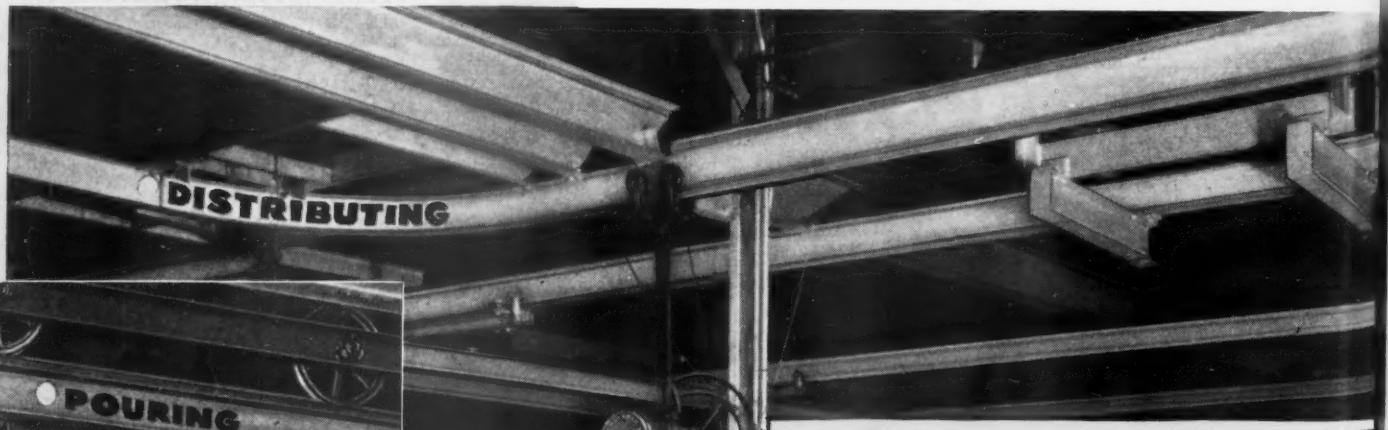
FROM CUPOLA SPOUT TO SPRUE HOLE...

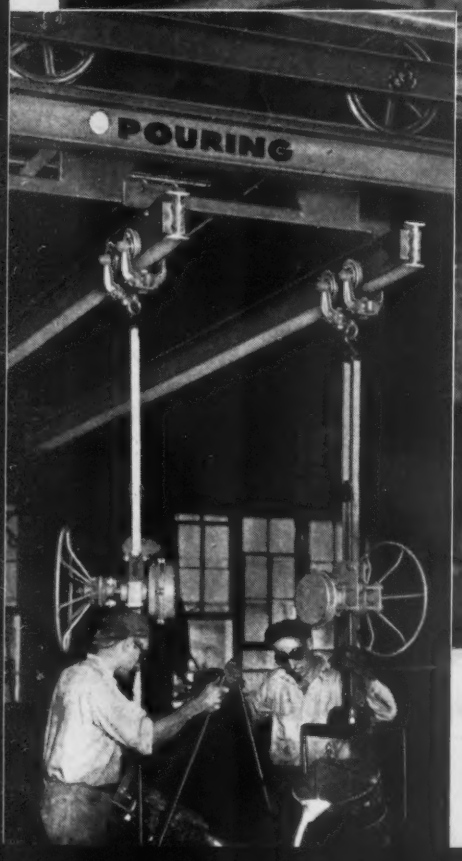
Engineering a co-ordinated system for the over-head RECEIVING . . . DISTRIBUTING and POURING of hot metal is highly specialized business: Much Foundry "Know-How" must go into the planning to move metals fast, yet SAFELY, too! Working together as a unit MODERN ladles . . . pouring devices . . . trolleys . . . hoists and cranes deliver their top tonnages through a rigid, hard-working track.

MODERN, rigid, I-beam, monorail sections — complete with switches and cross-overs — are bolted to roof trusses to meet the toughest of all service—FOUNDRY SERVICE!

Further completing the effectiveness of MODERN, over-head, hot-metal handling systems are dependable crane locks to link-in the distributing monorail with pouring cranes.

Shown here are three of these over-head crane and monorail combinations. Many more are covered in catalog 150. You can use the coupon. Or, if you have an immediate, over-head, handling problem plan now to write it up for the attention of a MODERN, layout engineer. There's no charge for this preliminary planning . . .





Two-up pouring from model "F" Pouring Devices and covered ladles of 300 lbs. capacity. The MODERN crane is an adjustable, double-beam type to serve a wide range of sprue-hole centers.

MODERN

MODERN EQUIPMENT COMPANY
DEPT. F-10, PORT WASHINGTON, WISCONSIN

MAIL TO MY ATTENTION:

Catalog #150 on cranes and monorail ☐
Catalog #P-152, New, Pouring Systems ☐
Catalog #147-A, cupolas and chargers ☐
MORE INFORMATION ON FREE-LOAN OF MODERN, SOUND, COLOR, 16mm FILMS ☐

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MODERN REPRESENTATIVES IN ALL PARTS OF THE WORLD

THIS IS THE FORTIETH MOLD . . .

from one application of

STEVENS LIQUID PARTING

That's normal experience in a large Midwest foundry that averages 1200 tons of castings per month. They use Stevens Liquid Parting for all of their molding operations. Here's why:

- Stevens Liquid Parting gives up to 60 molds from one application.
- Patterns are left clean, with no adhering sand.
- Molders save time . . . increase production with each mold because they do not have to shake parting on the patterns each time.
- Molds always give smooth castings since sand separates cleanly.

Stevens Liquid Parting can be the answer to your molding problems. Why don't you try Stevens Liquid Parting?

Write for a sample — or call your Stevens representative today.

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EVERYTHING FOR A FOUNDRY
DETROIT 16, MICHIGAN

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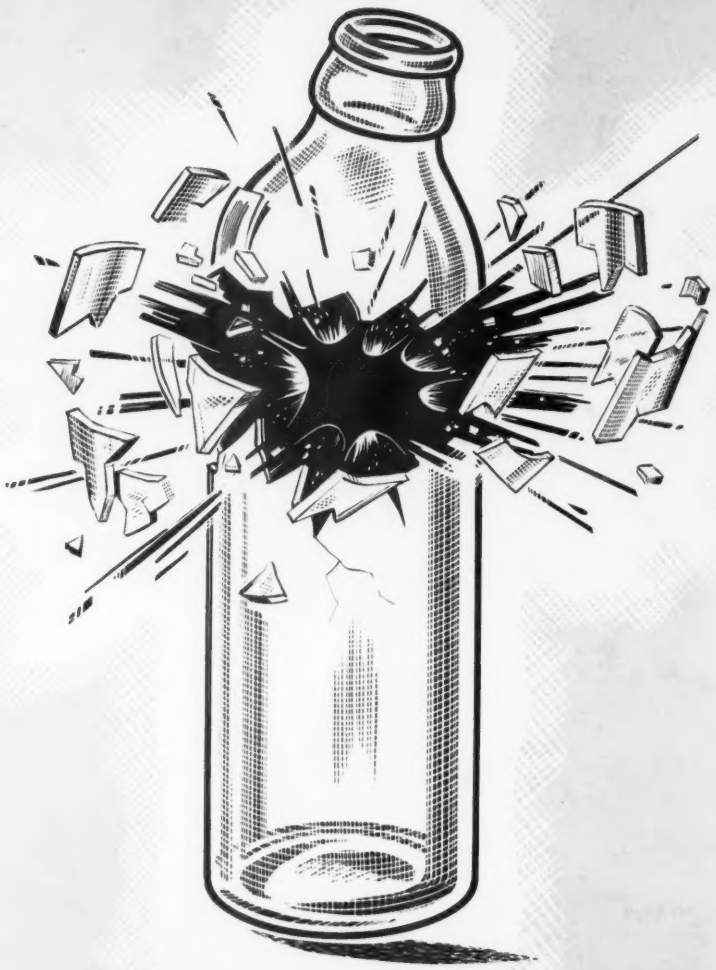
break your production bottlenecks with



BARTLETT-SNOW *Foundry Systems*

Properly designed equipment — strongly built to withstand the exacting requirements of foundry service — arranged and co-ordinated by our experienced foundry engineers synchronize all departments into a smooth, efficient, low cost operation.

● Bartlett-Snow foundry systems eliminate bottlenecks and inefficiencies in production. They automate the smooth, synchronized flow of material from sand and metal storage to the shipment of finished castings — provide adequate working areas, free access to machinery and materials. Many outstanding installations. Let us work with you on *your* requirements.

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